

# Ophthalmology

## Handwritten Note

**MBBS Help**

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Name: \_\_\_\_\_

Subject: \_\_\_\_\_

**Ophthalmology**

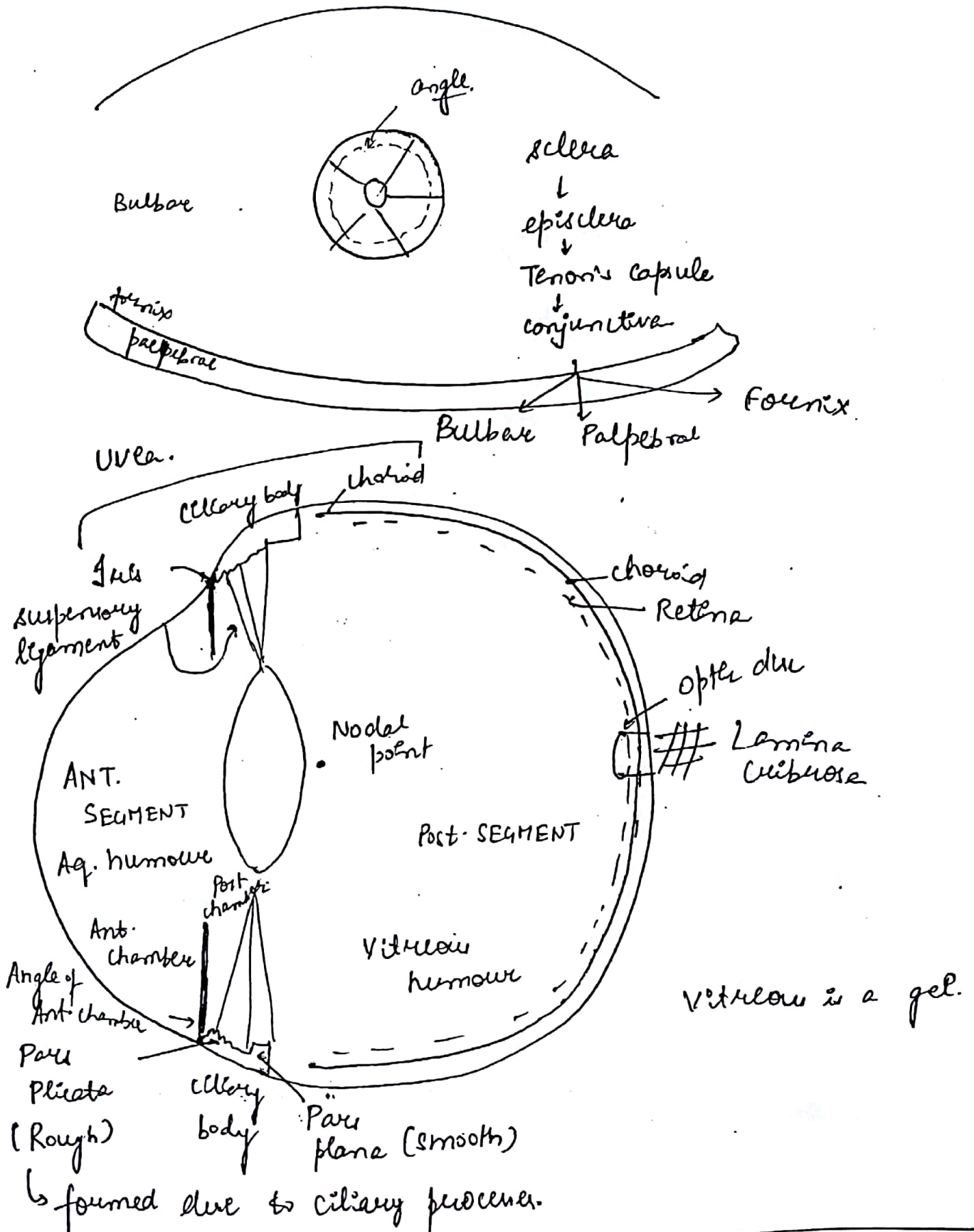




# EYE.

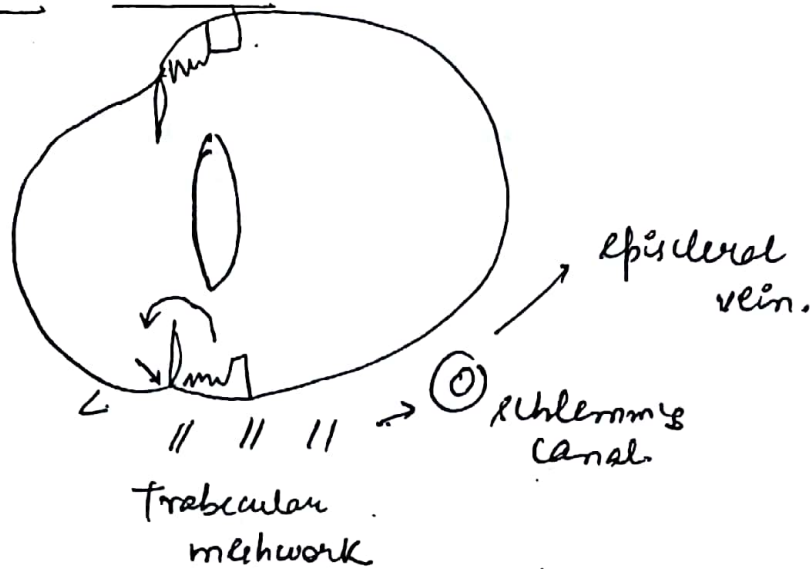
3

Join<sup>n</sup> of cornea & sclera → LIMBUS



## TRABECULAR OUTFLOW

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Q. Total no. of ciliary process  $\rightarrow 70-75$ .

Q. Angle is all around  $360^\circ$ , corresponding to limbus.

## NODAL POINT

- Parallel light rays falling on the cornea & lens, image is for rays are focussed on nodal point
- It is the 1st focal point situated just behind the lens
- Bending of light is more on cornea as compared to lens.
  - \* factors
    - ① curvature of cornea  
more is the curvature, more is the refractive power
    - ② difference of refractive index between air & water.

Q. What is the most imp. factor to focus light rays on retina?

ans. curvature of cornea [ant. surface].

Q. Why is the vision less when water is present in eye?

ans. becoz media is water. & water

↓  
less bending of light  
↓  
loss of refraction.

Cornea & lens are avascular. as they need to be transparent

They receive nutrition from aqueous humour

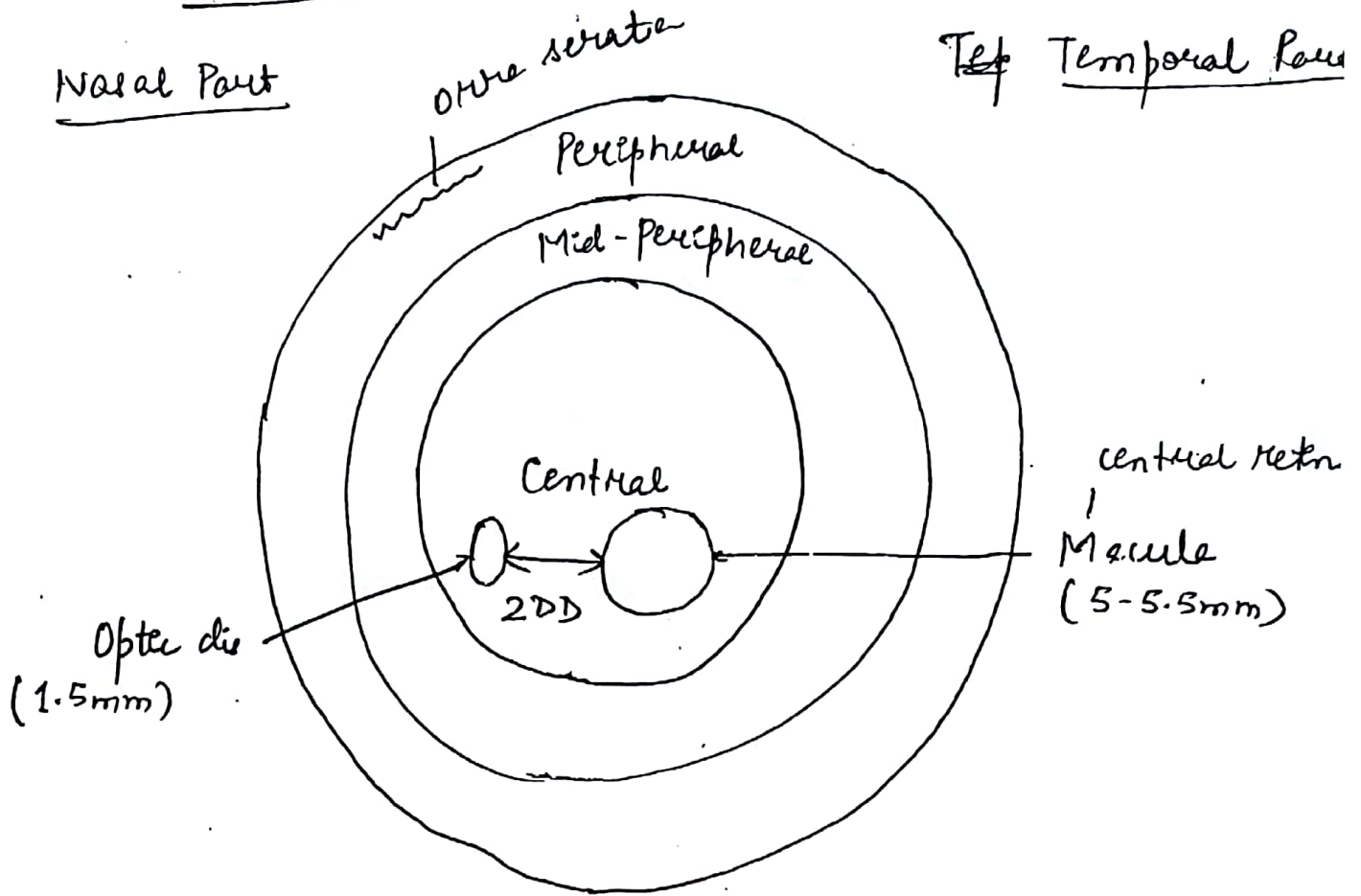
### OPTIC DISC

- The part where all the nerves aggregate.
- sclera here is sieve like  $\Rightarrow$  lamina cribrosa.

Q. IOP - 10-21 mm Hg

# RETINA

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Central Vision → macular func<sup>n</sup> → tested by Snellen's Chart

Peripheral Vision → peripheral retina → tested by Perimetry

## Scotoma-

An area in the visual field where the patient is not able to see.

## Blind Spot-

Physiological scotoma corresponding to optic disc  
↳ Temporal to macula.

## Isopter-

Different axis on which we test peripheral vision on perimetry.

## MACULA

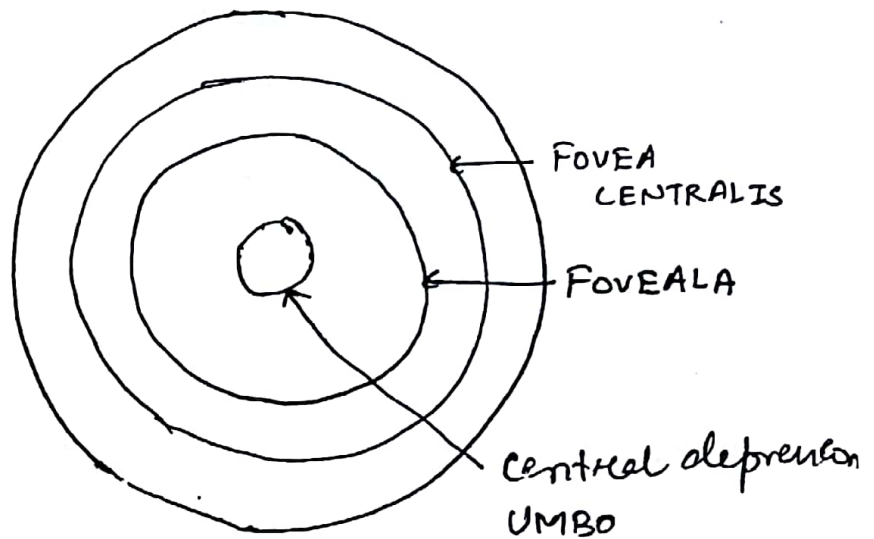
D → 5-5.5mm

\*Most sensitive part of Retina.



FOVEA.

(foveola is given in option becoz cones are found max. there)

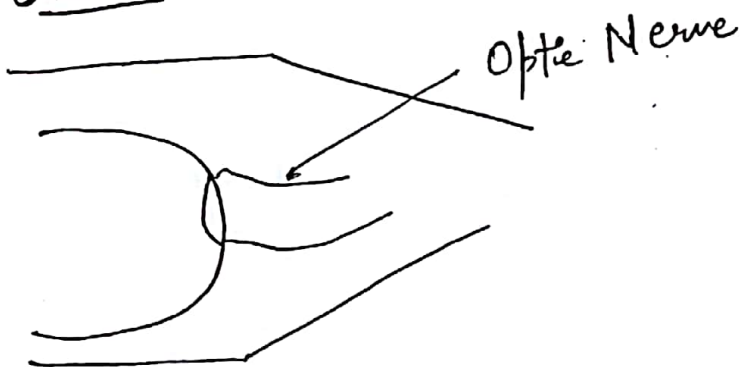


Thinnest part of Retina ⇒ Optic Nerve

Distance Bet<sup>n</sup> Optic Disc & Macula ⇒ .2DD  
= 3mm.

Most Resistant Layer of retina → Ganglion cell layer  
Most Radio Sensitive layer → Rods & cones

## ORBIT



Capacity of Orbit = 30cc

Shape of orbit = Quadrilateral or Pyramidal

Length of Optic Nerve = 35cm - 5.5cm. [5cm]



Axial Length of eyeball = 24 mm.  
[Antero-posterior diameter].

USG

A Scan

↓  
for measuring  
antero-posterior  
diameter

B Scan

↓  
for post. segment of  
eye

Depth of Ant. Chamber = 2.4 mm - 2.5 mm.

2.5

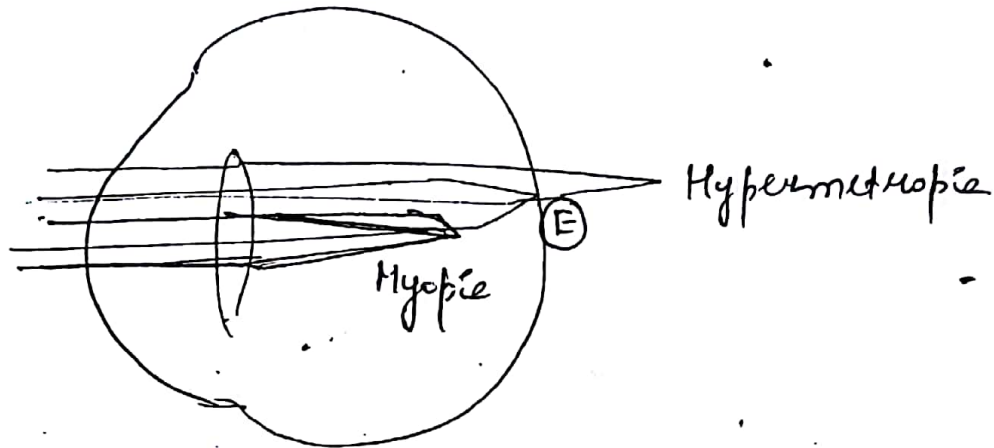
Anisometropia

any difference of refractive power between the  
2 eyes of  $> 2.5$  diopters

• Y Infant is ~~not~~ hypermetropic.  
2.5 - 3 Diopters due to small eye.

## HYPERMETROPIA

Total refractive power of eye is less than required



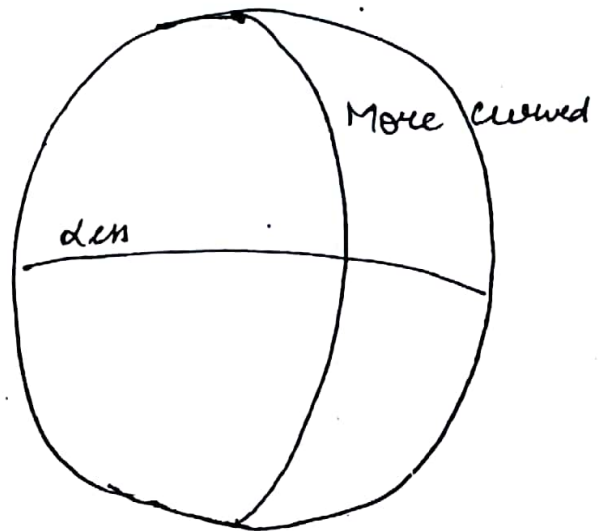
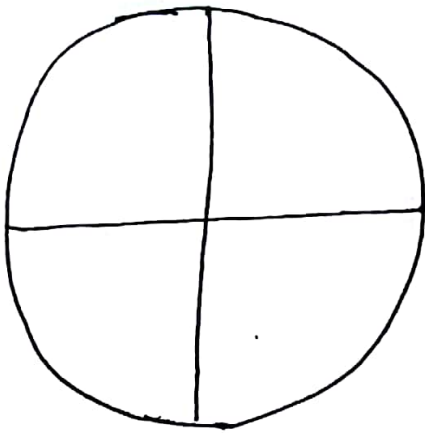
- Small eye
- Light rays are focussed behind the retina
- To correct the error  $\Rightarrow$  CONVEX LENS Used.  
(+)

## MYOPIA

- Total Refractive Power is more than required
- Large eye
- Light rays are focussed in front of retina
- To correct the error  $\Rightarrow$  CONCAVE LENS Used.  
(-)

# ASTIGMATISM

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Difference of refractive power between 2 principal axes

## REFRACTION.

• Total Refractive Power of eye = 58-60 D.  
or  
Reduced eye

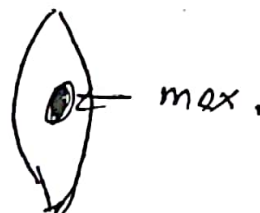
• Reduced eye:-

Simplified optical system of eye

• Refractive Power of Cornea  $\rightarrow 43-45 \text{ D. } Q$   
• " " " Lens  $\rightarrow 16-17 \text{ D. } Q$

• Refractive Index of cornea  $\rightarrow 1.37 \text{ } Q$   
• " " " Lens  $\rightarrow 1.39 \text{ } Q$

• Maximum Refractive Index  $\rightarrow @ \text{ centre } \rightarrow 1.4-1.41$



## RETINOSCOPY

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- Objective method of refraction.

## FUNDOSCOPY

- for ~~meas~~ retina fundus is synonymous.

PAPILLA - for optic disc.

Q. Q.

## OPHTHALMOSCOPE

### DIRECT

Magnification = 15 times

Image → Virtual,  
Erect.

Area/Field - 2 DD

Used for  
Central Retina

### INDIRECT

5 times.

Real,  
Inverted

8 DD.

Peripheral Retina +  
Central Retina  
(but magnification is less)

## Distant Direct Ophthalmoscopy :-

for viewing media

all the str.  $\subseteq$  comes in the way of light



Distance for DDO = 25cm

C Lenticular opacity is best seen by DDO  
= Post. Subcapsular Cataract

## CORNEA

Shape - aspheric  
curvature is gradually ↓

Diameter - 11-11.75 mm

Megalocornea > 13mm. [adult]  
Microcornea < 10mm [adult]



## LENS

Shape - Biconvex

Diameter - 9-10 mm [9].

Microphakia - small lens.  
< 9mm

Microphakia - small spherical lens

Aphakia → absence of lens

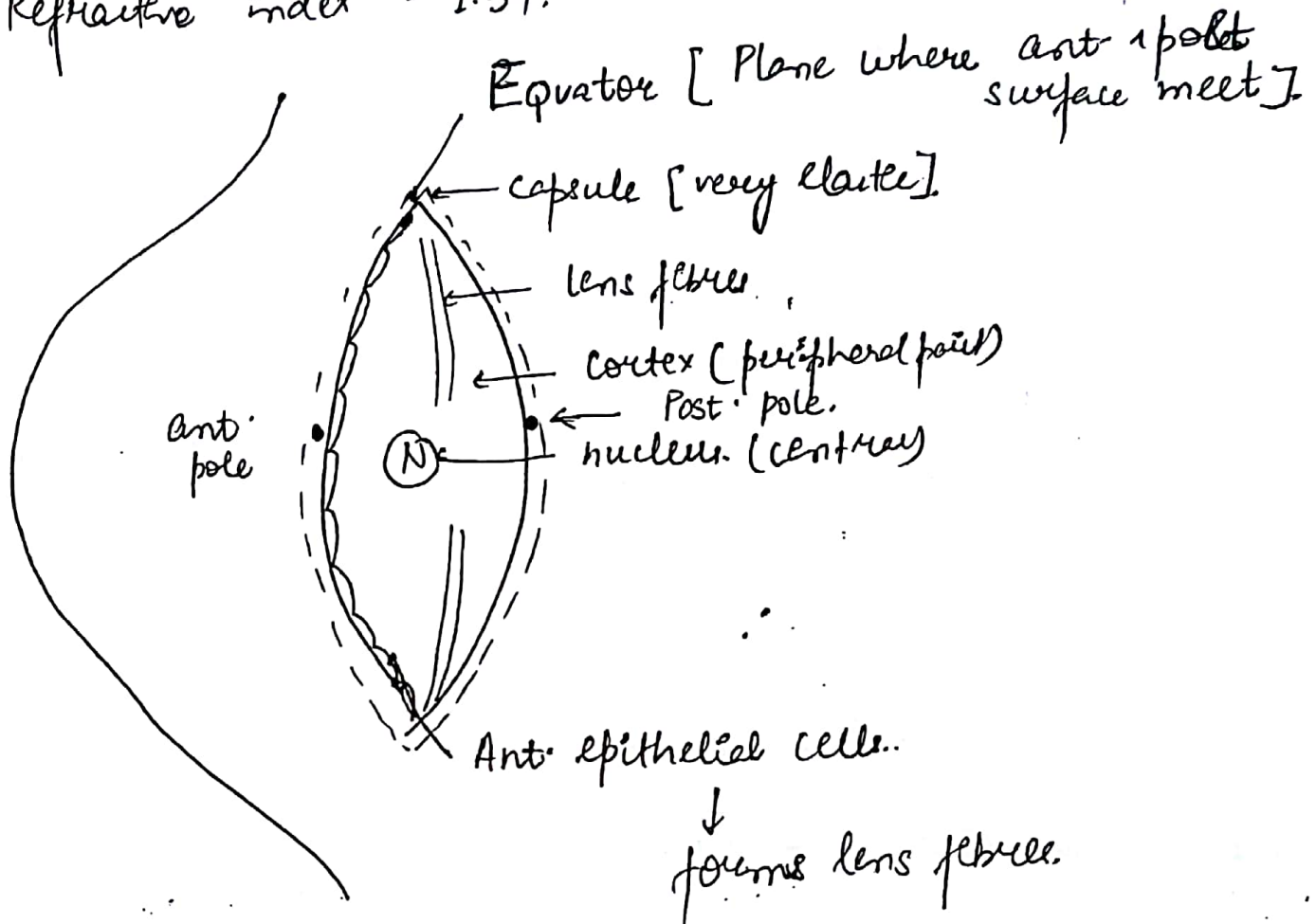
Pseudophakia → artificial IOL



# DISEASES OF LENS

Power - 16-17D

Refractive index - 1.39.



Q. C is the thinnest part of lens  
 ↳ capsule at posterior pole [thickness  $4\mu$ ].

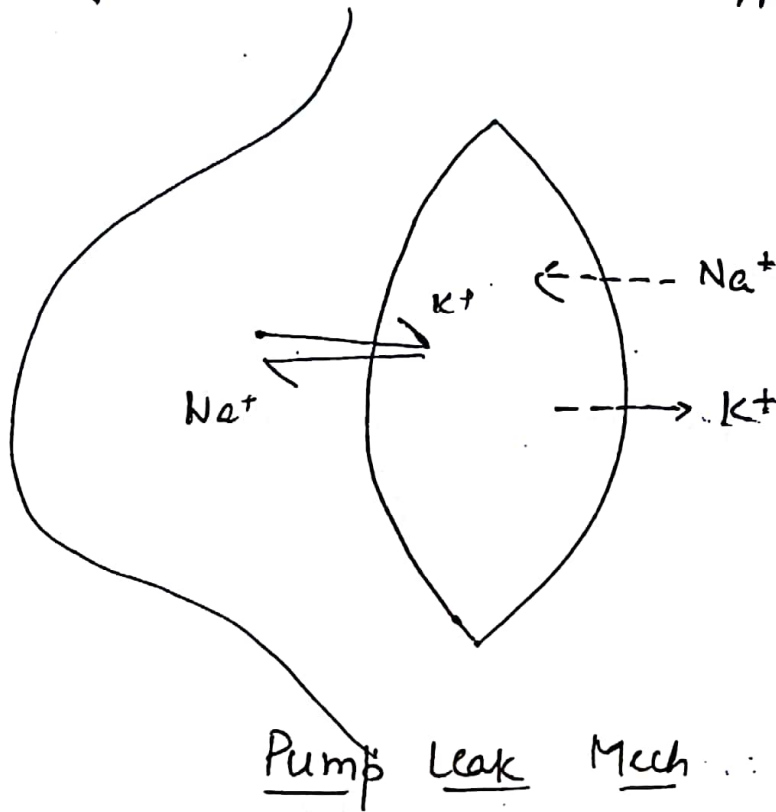
Q. C are the youngest fibres - Cortex

Q. Till what time period lens fibres are formed → throughout life.

## PHYSIOLOGY

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- Avascular
- Dehydrated [lens maintains this by Pump Leak mechanism]



Q 1<sup>o</sup> Metabolism = Anaerobic [80% of glucose metabolised anaerobically]

p Lens derives its nutrition from Aqueous Humour only.

• Lens is derived from Surface Ectoderm.

HM3 + HM4 are insoluble high molecular wt proteins found in CATARACTOUS LENS.

# EMBRYONIC DEVELOPMENT.

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## SURFACE ECTODERM

- ① Epithelial lining of cornea & Conjunctiva
- ② " " " Lacrimal Gland
- ③ Lens Q.
- ④

## NEUROECTODERM

- ① Retina
- ② Optic ~~nerve~~ Nerve
- ③ Epithelial lining of Iris & Ciliary Body Q
- ④ Smooth M/s of Iris → ① Iris sphincter Q.  
② Dilator Pupillae
- ⑤ 2° & 3° vitreous Q.  
↓                      ↓  
adult                  suspensory ligament

## NEURAL CREST

- 1) Sclera except temporal part
- 2) Choroid
- 3) Corneal Stroma Q
- 4) Corneal endothelium Q
- ⑤ Ciliary M/s Q.
- ⑥ Trabecular Meshwork

## MESODERM

- ① Temporal Part of sclera
- ② EOM.
- ③ Blood vessels.
- ④ 1<sup>o</sup> vitreous Q.  
↳ vitreous during embryonic period

## CATARACT

Any opacity in lens or its capsule  $\perp$  hinders its optical homogeneity

### Classification



### CONGENITAL CATARACT

Etiology ① TORCHS Infection

② Radiation exposure in 1st Trimester

③ Teratogenic Drugs eg  
Thalidomide

④ Malnutrition

⑤ Anoxia

## Type

### 1) BLUE DOT CATARACT-

Opacities are seen as Bluish Dots.

### 2) CATARACTA PURVULENTA-

Opacities are powdery.

### 3) LAMELLAR/ZONULAR CATARACT-

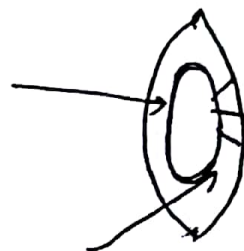
Single lamella is cataractous.

Additional spoke like opacities.

over the cataractous lamella - RIDERS

Vit D deficiency cause. Lamellar Cataract

Rubella infection also cause.



### 4) Ant. POLAR CATARACT



### 5) Post. POLAR "



### 5) TOTAL CONGENITAL CATARACT

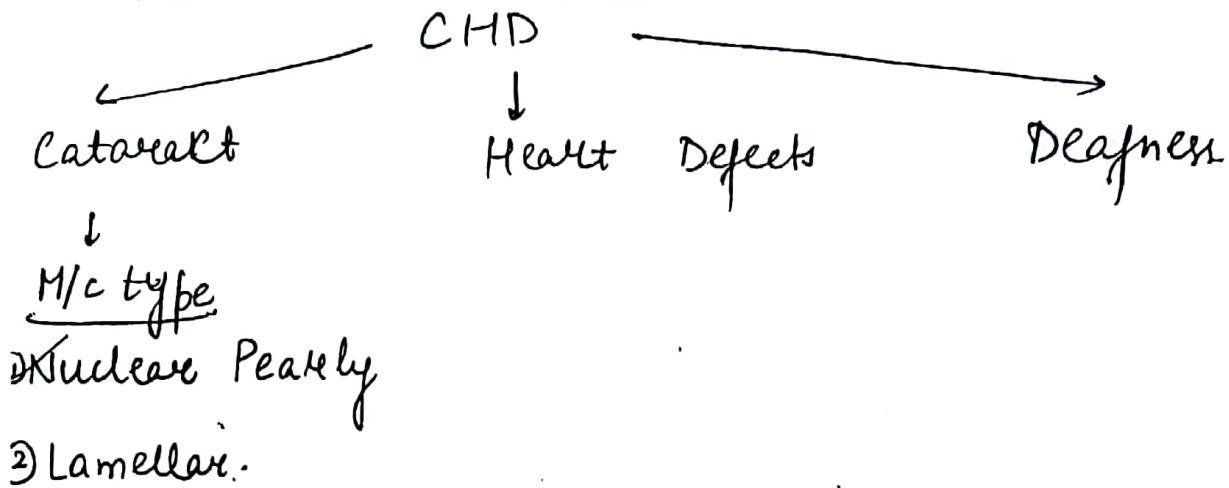
Q. M/c type of congenital Cataract - Blue-Dot

Q. M/c type ' ' causing diminution of vision  
- lamellar.



## CONG. RUBELLA SYNDROME

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### \* Ocular Features of Rubella :-

- 1) Microphthalmos  
↳ Any axial length of eyeball  $< 21\text{mm}$ . or  
1 year of age  $< 19\text{mm}$ .
- 2) Rubella Keratitis.
- 3) Angle anomaly leading to Glaucoma
- 4) Nuclear Pearly Cataracts
- 5) Salt & Pepper Fundus.  
↳ pigmentary disturbance of retina due to diffuse chorio-retinitis.

### D/D of Salt & Pepper Fundus

- 1) Rubella
- 2) Syphilis
- 3) Retina Pigmentosa sine pigmento

#### ④ Myotonic Dystrophy

↓  
Type of cataract ⇒ Christmas Tree.

#### ⑤ Leber's Amaurosis

Amaurosis :- Total Loss of vision.

Amblyopia :- Partial Loss of vision

Amaurosis Fugax :- Transient Loss of vision.  
↓  
curtain like manner.

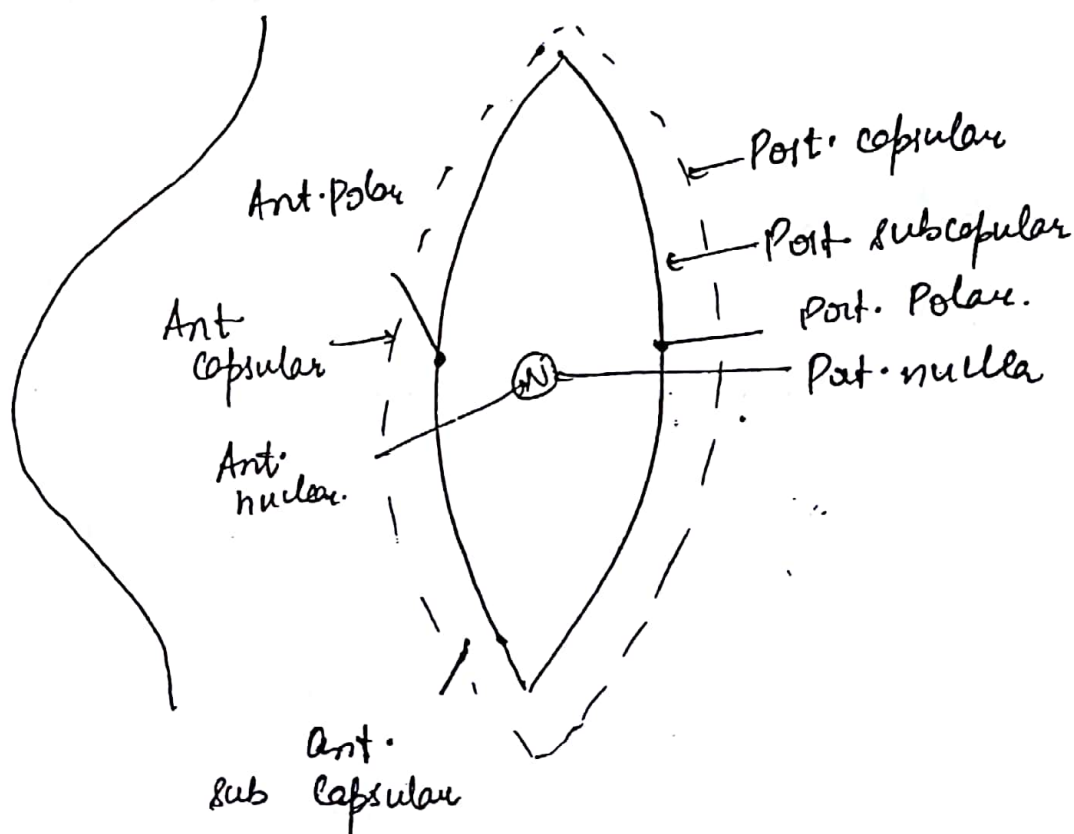
### ACQUIRED CATARACT

#### CLASSIFICATION

Anatomically

A/c to maturity

Etiology



c cataract will ↓ vision most = post subcapsular.

↓  
as it is near to the nodal points.

### \* A/c to Maturity -

1) Immature



2) Mature



3) Hypermature

- degenerative changes + nt
- wrinkling of capsule occurs
- liquefaction of cortex



wrinkling of capsule

### \* Etiological Classification

1) Senile → M/c

2) Metabolic

3) Complicated

4) Toxic

5) Traumatic

6) Radiation

# SENILE CATARACT

## CORTICAL

Etio - Hydration

## NUCLEAR

Etio - Nuclear sclerosis

Insoluble  
protein  
deposition

Pigment  
Deposition.

Melanin      Urochrome <sup>Q</sup>

C/F

I - Stage of Lamellar separation.

II - Stage of Incipient Cataract [Immature cataract]  
little hydration

III - Stage of Intumescent Cataract  
(max. hydration)

IV Mature Cataract

V Hypermature/Morgagnian Cataract

M/c complication

↓  
PHACOLYTIC GLAUCOMA

I. Immature

II. Mature

III. Hypermature  
or

Nuclear Sclerotic  
Cataract

↓  
M/c complication Q

↓  
Subluxation of Lens.  
(Partial dislocation)

## Phacolytic Glaucoma

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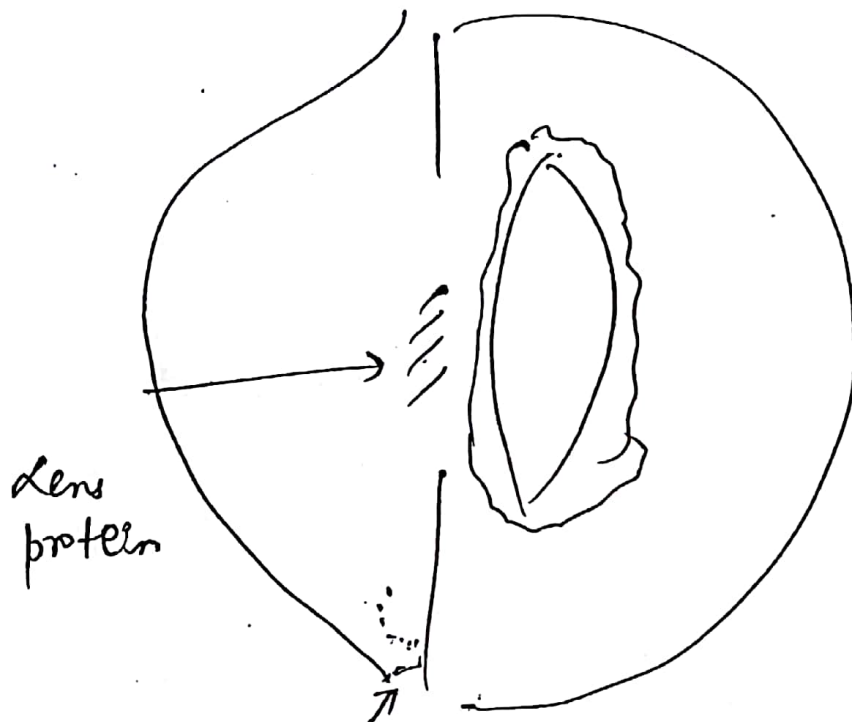
Leakage of lens protein in the aqueous



Block TMW.



Leading to Glaucoma



Block TMW  $\Rightarrow$  Glaucoma

Radial Spoker  $\Rightarrow$  Seen in Cortical Cataract  
also k/n/a Cuneiform cataract

Cupuliform Cataract - Post Subcapsular Cataract

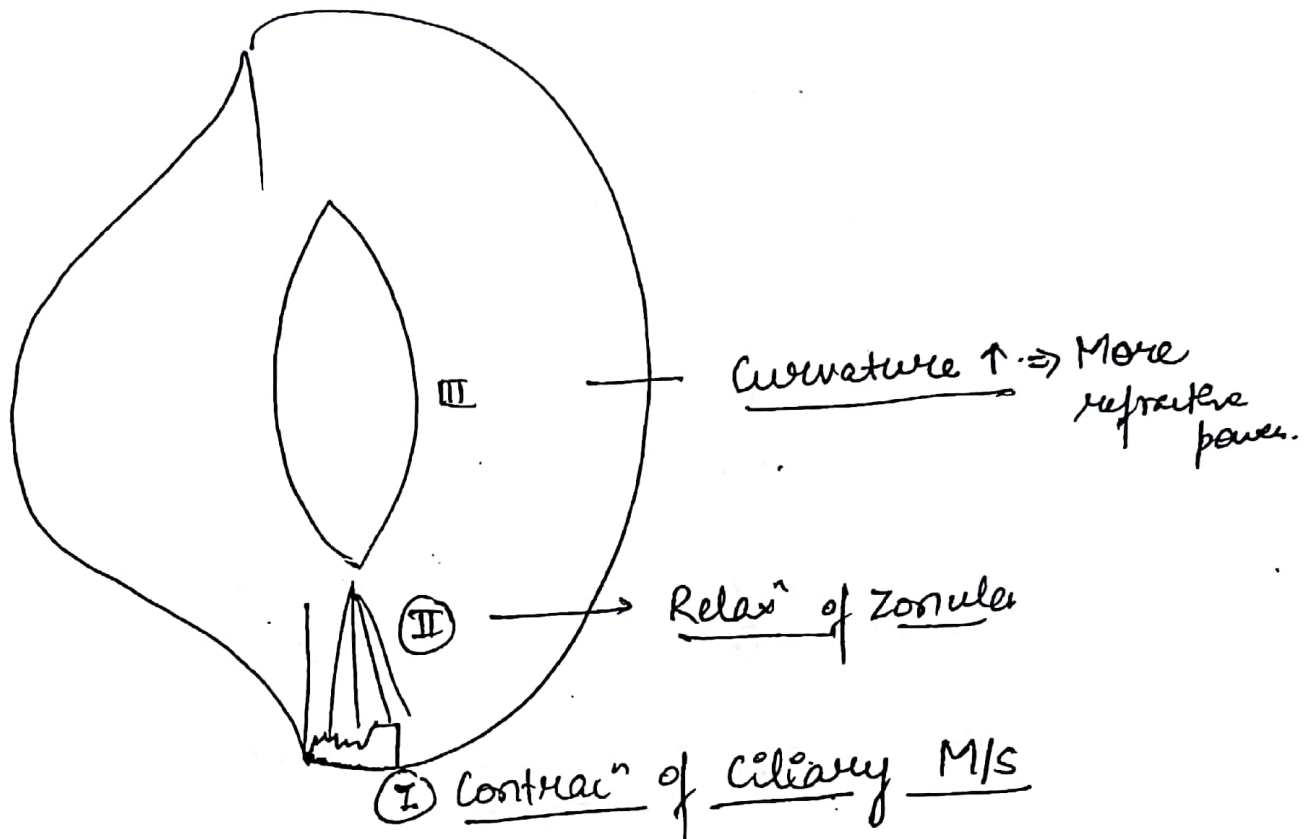
II<sup>nd</sup> Sight Of Old Age :-

- Improvement in near vision.
- occurs due to nuclear sclerosis in early stage



# ACCOMODATION

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## AGE RELATED CHANGES

- 1) Weakening of ciliary M/s
- 2) Less elasticity of lens

3)

$\Downarrow$   
PRESBYOPIA - error of accommodation.  
sets at the age of 40 yrs. [ $\geq 40$  yrs]  
Presbyopic glasses [Near glasses]  
 $\downarrow$   
CONVEX LENS

# METABOLIC CATARACT

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## I) DIABETES

Cause - Accumulation of Sorbitol.

↓  
Hyperosmotic nature

↓  
Imbibe  $H_2O$

⇓  
CATARACT

Enzyme responsible for sorbitol pathway -  
NADPH dependent aldose reductase

Type of cataract ⇒ snow flake or snow storm cataract

↓  
More common in Type-I DM

## II) GALACTOSEMIA [Reversible cataract]

↓  
Galactokinase deficiency

⇓  
LAMELLAR CATARACT

↓  
GPUT  
(galactose phosphate uridylyl transferase)

⇓  
OIL-DROPLET CATARACT

### III CHALCOSIS

Cu containing  
F.B.

↓  
SUNFLOWER  
CATARACT.

25  
Wilson's Disease

↓  
K.F. Ring.  
(on cornea)

Cu deposited on  
Descemet's membrane

Reversible

### FLEISCHER'S RING

- seen in pts. of Keratoconus.
- occurs due to Fe deposition
- Deposition on Epithelium



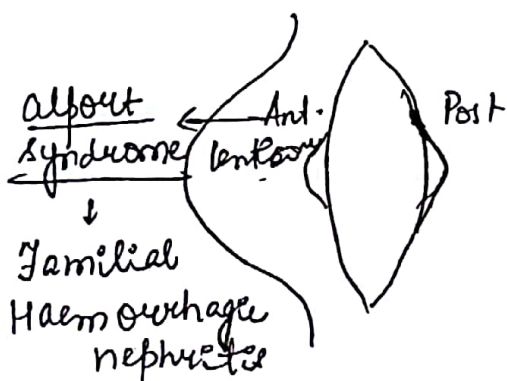
### IV LOWE'S SYNDROME / OCULO-CEREBRO RENAL SYNDROME

Ocular features

(A) LENS

- 1) Microphakia
- 2) Metabolic Cataract
- 3) Posterior Lenticonus

(B) GLAUCOMA-



→ oil-globule reflex + rt  
Ant. Lenticulus is more common in ♂

↓  
 1) Alport's syndrome

2) Waardenburg Syndrome



a) Telecanthus - medial canthus are far apart

b) Poliosis - greying of eyelashes

c) Heterochromia Iridis (HI)

Difference of iris colour between 2 eyes

d) Anterior Lenticulus

### TELECANTHUS

- soft tissue problem.
- Interpupillary Distance  
 (N)

### HYPERTELORISM

- Bony Defect
- Interpupillary Distance ↑

## COMPLICATED CATARACT

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Cataract is occurring as a complication of ant. + post segment disease

C/F -

- 1) Polychromatic Lusture.
- 2) Bead bump appearance of opacities.
- 3) M/c type  $\Rightarrow$  Posterior subcapsular

## TOXIC CATARACT

Due to Drugs.

1) Steroids

2) Phenotheazines

3) Long acting Miotics

4) Amiodarone

5) Busurphan

6) Gold

7) CQ

Ant. Sub  
capsular

Post. sub  
capsular  
Cataract

M/c comp<sup>n</sup> of steroid in eye  $\Rightarrow$  Glaucoma

(OAC - open  $\rightarrow$  blockage in TMW)

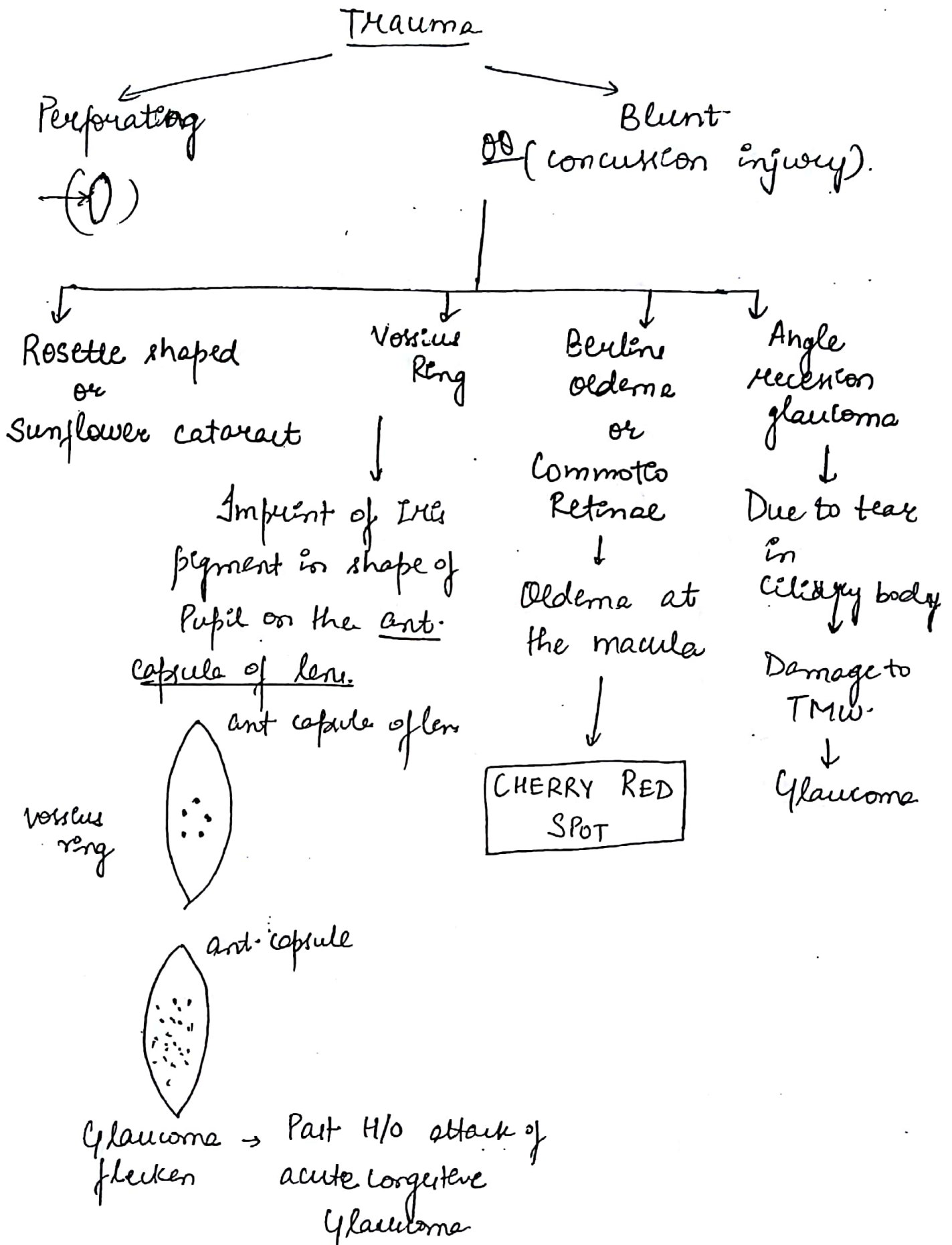
steroid  $\left\{ \begin{array}{l} \text{Systemic} \rightarrow \text{Cataract (PSC)} \end{array} \right.$

$\left\{ \begin{array}{l} \text{Topical} \rightarrow \text{Glaucoma} \end{array} \right.$



# TRAUMATIC CATARACT

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## C/F of cataract :-

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Blurring of vision

(E) → 5/minutes

2) Diminution of vision  
vision  $< 6/6$

Denominator is normal

- All letters form an angle of 5 minute at nodal point
- Margin of every letter subtend an angle of 1 minute

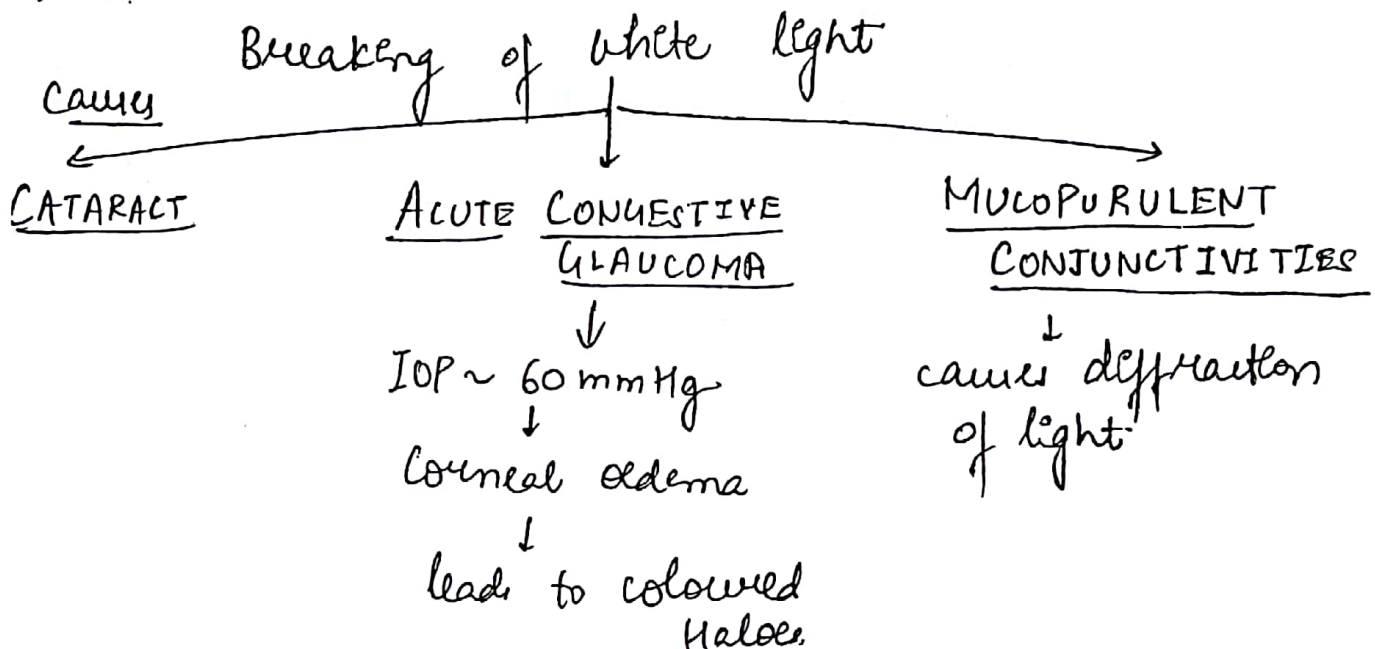
3) Glare

4) Polyopia

→ 2 images.

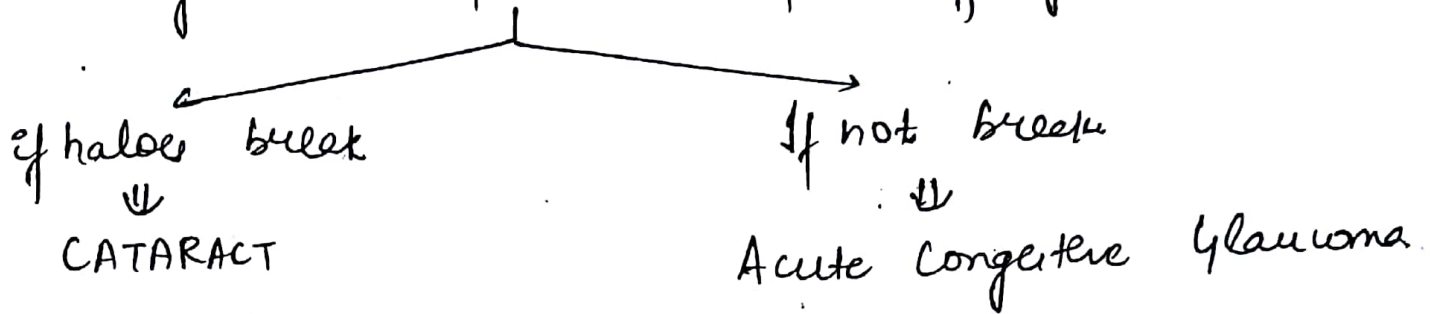
Incipient cataract (✓) (None)  
Intumescent cataract

5) Coloured Haloes



## Fincham's Test :-

- Test to differentiate Between coloured haloes of Cataract & Acute Congestive Glaucoma
- Placing a stenopie slit in front of eye



T/t

### SURGICAL

① ICCE [Intra capsular Cataract Extraction]

↓  
Removal of lens including capsule

### METHODS.

a) Forceps Extraction.

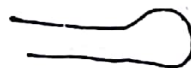
By Arvuga's forceps.

b) Cryo extrac"

-40°C temp.

lens sticks to the probe & can be taken out.

c) Wire Vector Method.



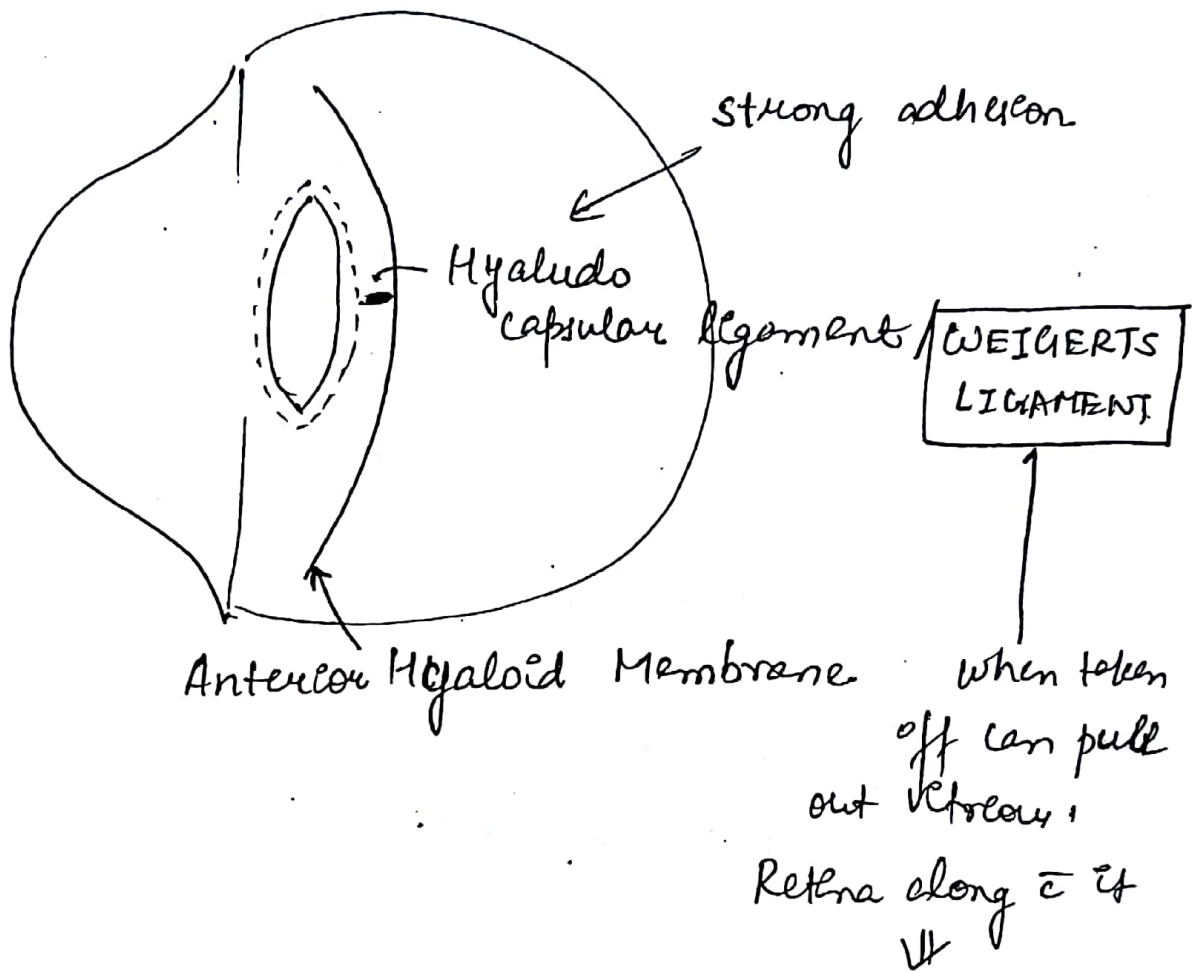
d) Indian Smith Method.

pressure & counter pressure method.

Only Indication  $\Rightarrow$  subluxation of lens

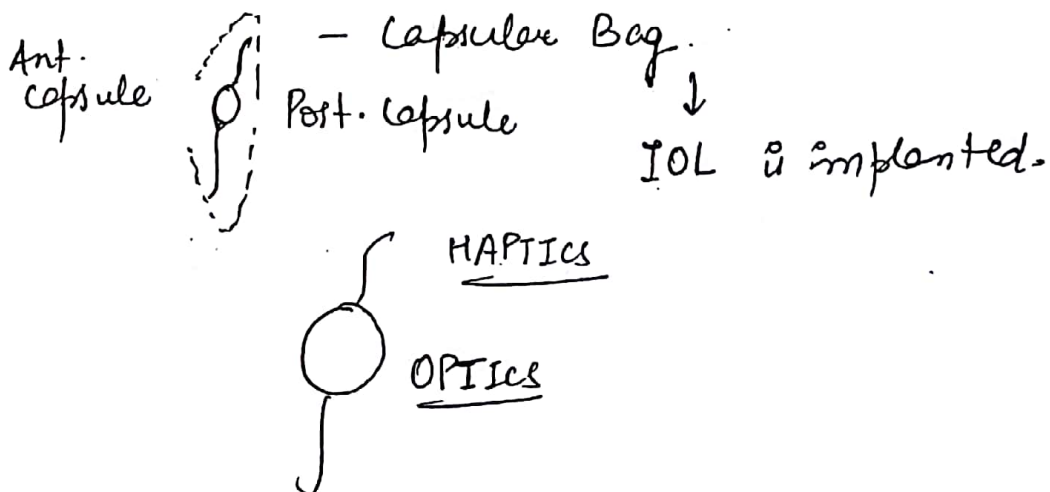
Best Method  $\Rightarrow$  Cryopexae<sup>n</sup>

C/I in children



Hence ICCE C/I in children

## II) ECCE + PC IOL Implantation.





IOL is formed of PMMA (Poly Methyl Methacrylate)<sup>33</sup>

## METHOD

Full thickness scleral incision



Ant. capsulotomy



H<sub>2</sub>O injected under the margin



Hydrodissection.



Removal of nucleus by pressure, counter pressure



Clean the bag = evulsion & aspiration.



IOL Implantation



Suture the section by radial sutures.

[equal length, equidistant]

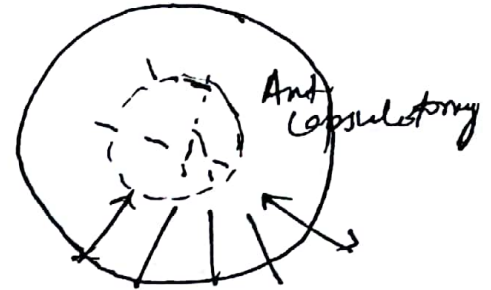


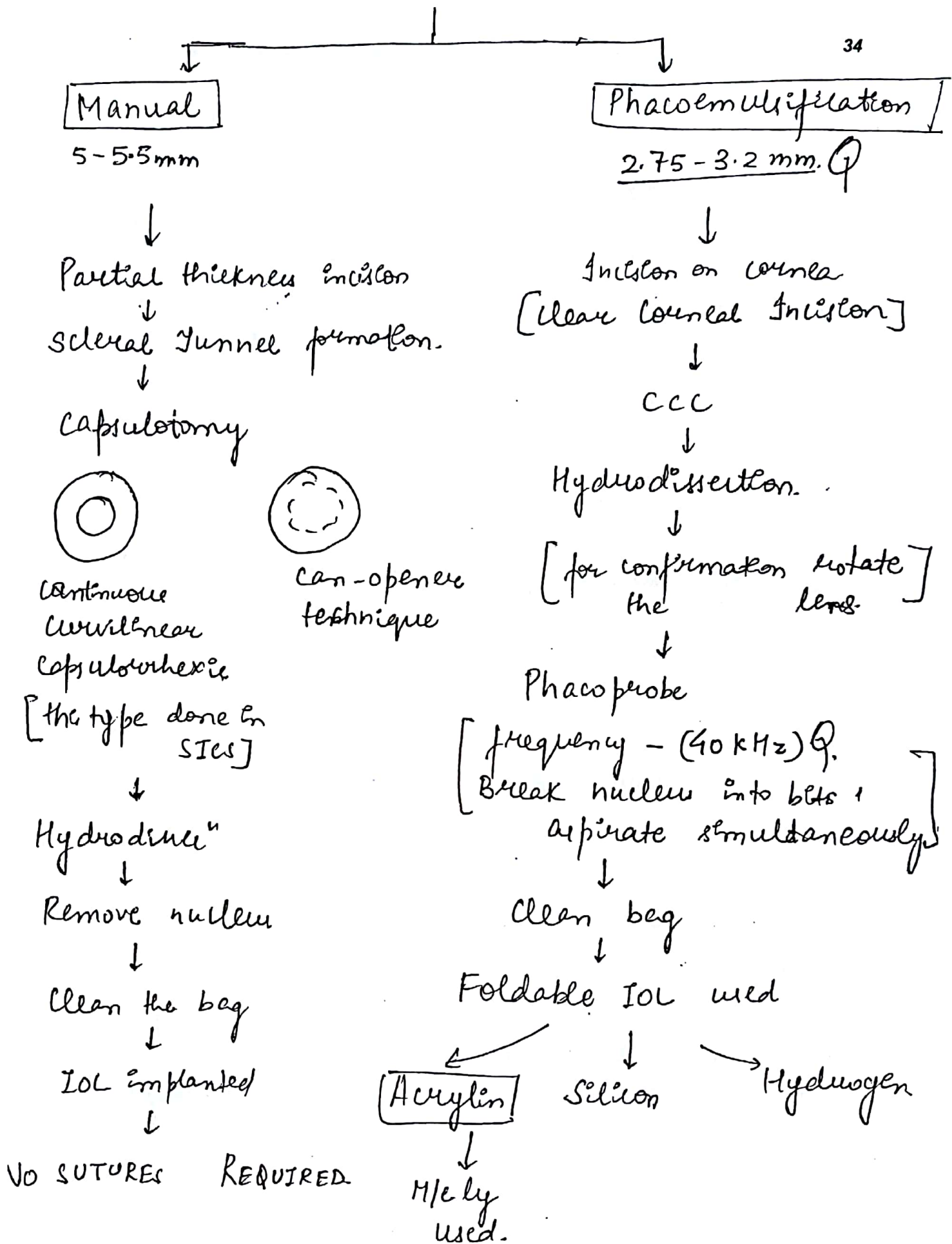
less astigmatism post-op.

③ SICS (Small Incision cataract surgery)

Small incision

← sutureless surgery





④ MICS [Minimal Incision Cataract <sup>35</sup> Surgery].

By Phacoemulsification - length of incision 1.8-2.4 mm

⑤ PHACONIT

Incision length - 0.9 mm.



Rollable IOL [Acrylic].

⑥ FEMTOLASER Most Recent

Infrared.

$\lambda = 1052 \text{ nm.}$

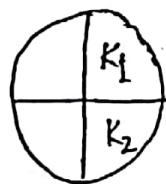
Pulse Duration -  $10^{-15} \text{ sec}$  Q.

### BIOMETRY

Method of calculating Power of IOL

— Axial length by USG.

— Keratometry



$\sim K:$

SRK formula :

$$\text{Power} = A - 2.5L - 0.9K.$$

where  $A = \text{constant}$

$L = \text{Length axial}$

$K = \text{Keratometry, } K.$

# Foreal Reflex Formation / Fixation Reflex / Macula Maturation.

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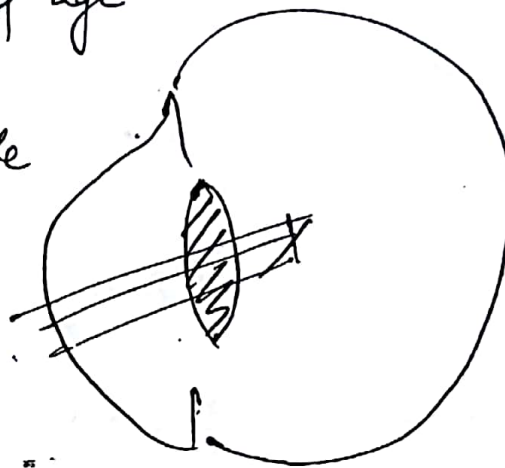
↓  
 form by 5-6 months of age

↓  
 Operate as soon as possible

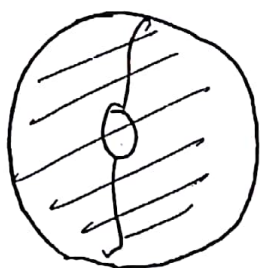
↓  
 To prevent amblyopia

↓  
 also nystagmus develops ..

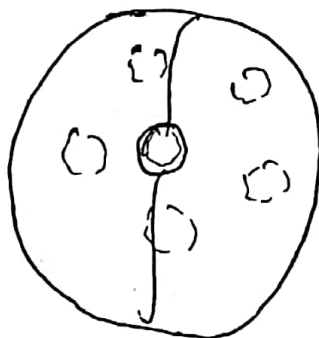
T/t of choice in cong. cataract ⇒ Lensectomy  
 +  
 Vitrectomy  
 (Phaco + ECCE)



## AFTER CATARACT / 2° CATARACT / POST. CAPSULAR OPACIFICATION



Diffuse  
 Opacification.



Migrated ant-  
 epithelial cells.  
 [ELSCHNIG PEARLS]

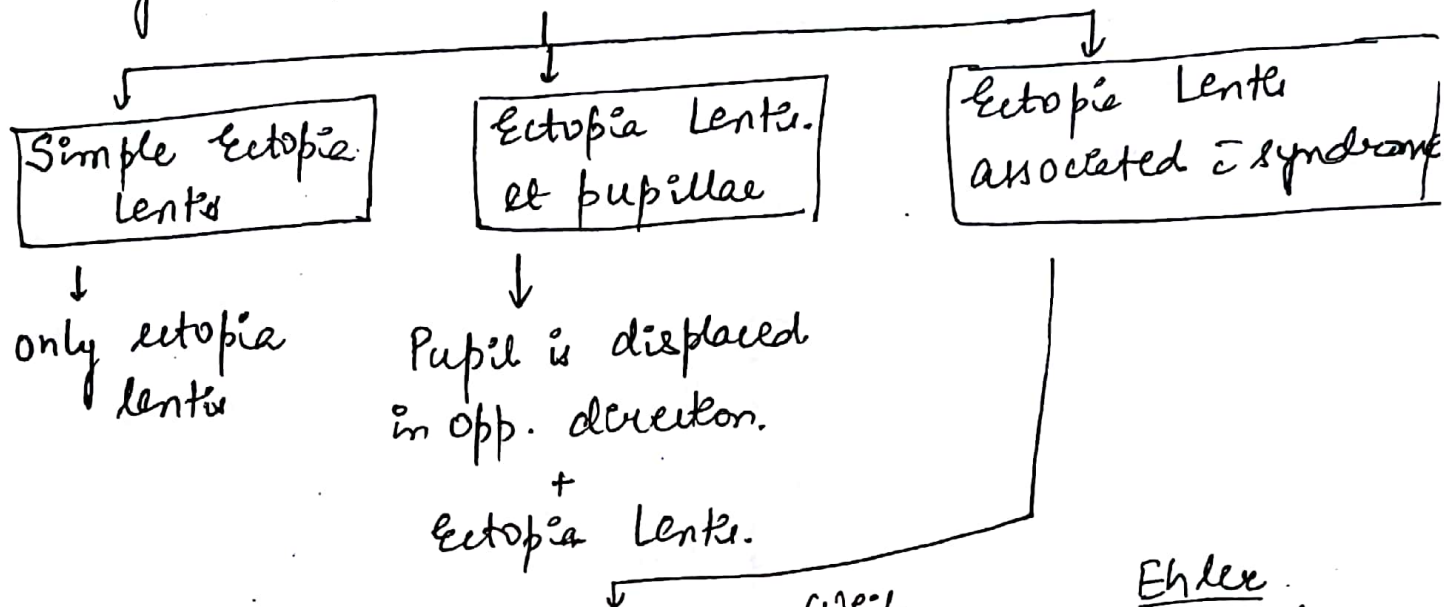


Fibrotic Ring  
 [SOEMMERING RING]  
 ↓  
 Vision not affected

Management :- Post-Capsulotomy through Nd:YAG Laser

## SUBLAXATION OF LENS

Congenital  $\Rightarrow$  ECTOPIA LENTIS



MARFAN'S SYNDROME

$\Gamma$  M

Superio temporal ectopia

Homocystinuria

$\Gamma$  M

Infero-nasal

Weill Marchesani

① Downward & forward

② Microspherophakia

Ehler Danlos

① Ectopia lenti

② Blue Sclera (thin sclera)

Ocular features of Marfan :-

1) Axial Myopia

2) Megalocornea  $\rightarrow$  Most prominent feature

3) Supero-Temporal Ectopia Lenti  $\rightarrow$  Most common

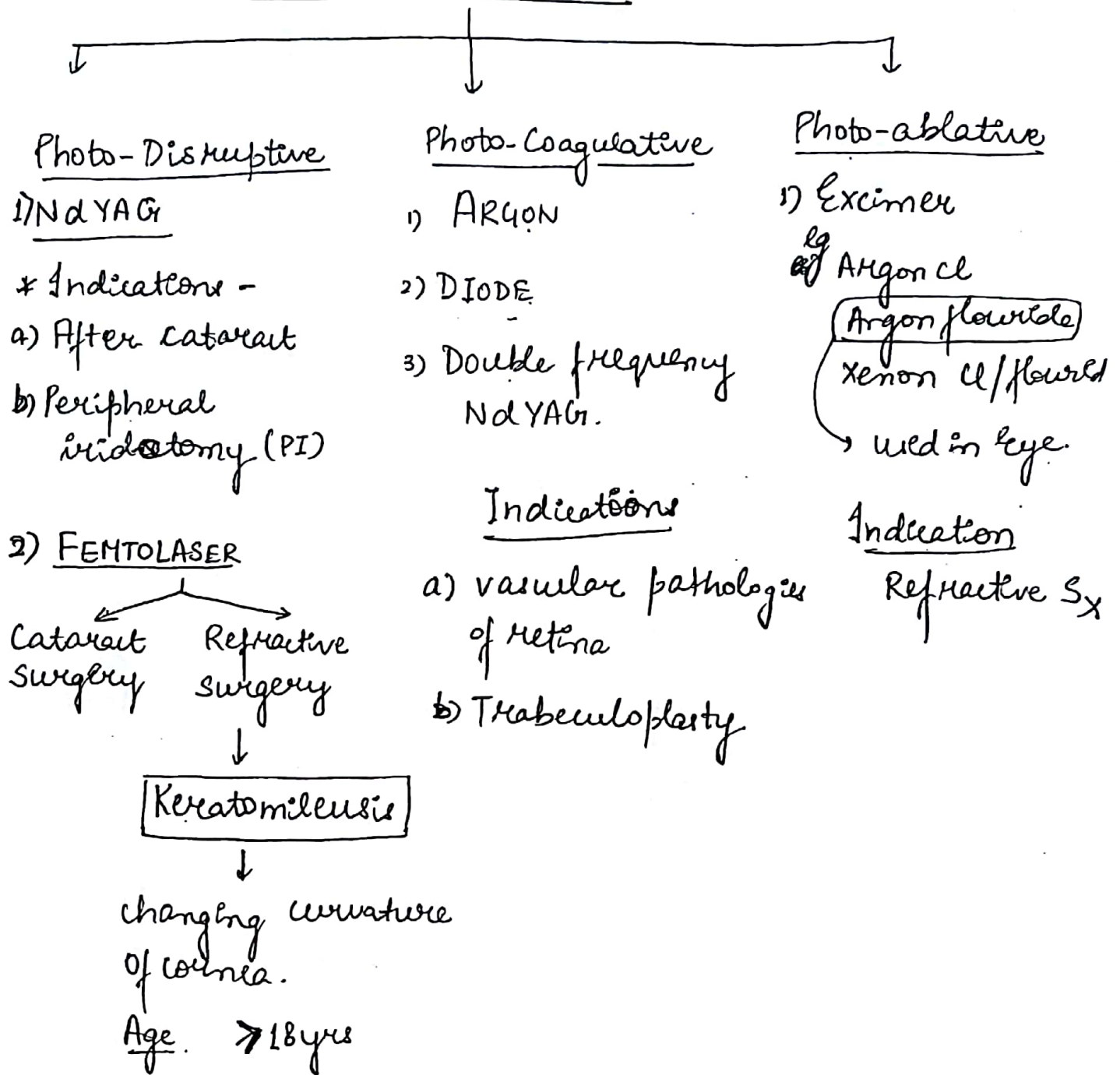
4) Lattice Degeneration.

5) Retinal Detachment



# LASERS IN EYE

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## WAVELENGTHS

- 1) Nd:YAG - 1064 nm (Pulse Duration -  $10^{-9}$  s)
- 2) EXCIMER - 193 nm.
- 3) ARGON - 514 nm.
- 4) DIODE - 780 - 850 nm.
- 5) Double frequency Nd:YAG - 532 nm.
- 6) FemtoLaser - 1052 nm. (Pulse Duration -  $10^{-15}$  s)

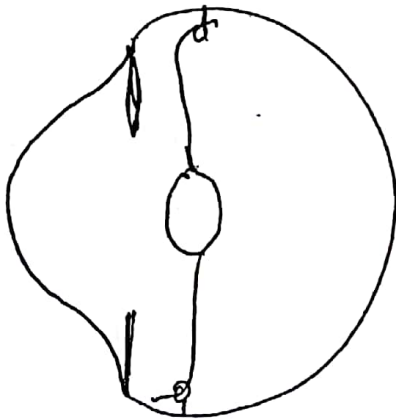
## Femtolasere

### LASIK

- To raise a flap containing epithelium & little bit of stroma (cornea) by femtolasere

### SMILE Procedure [small Incision Lenticule Extraction]

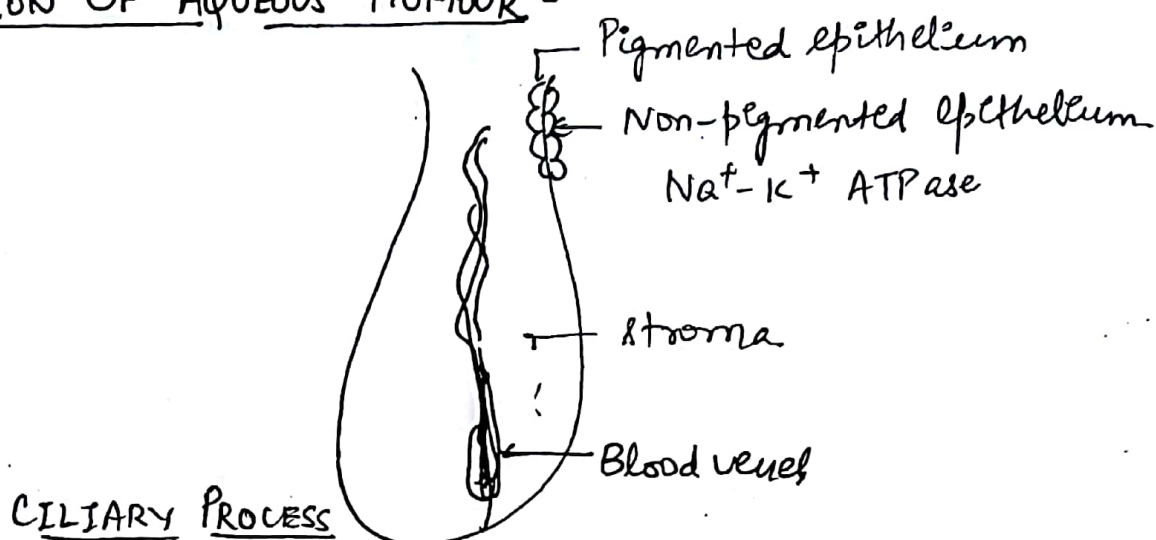
- No need to make a flap
- Focus on stroma & cut small part of stroma
- Give incision (small) & remove the lenticule (stroma).



Scleral Fixated IOL [when post-capule not int]

# GLAUCOMA

## \* FORMATION OF AQUEOUS HUMOUR -



Non-pigmented epithelium is the site of aqueous formation.

### Process

- 1) Secretion [Max. aqueous is formed by this]
- 2) Diffusion
- 3) Ultrafiltration.

Rate of formation of aq. humour =  $2-3 \mu\text{L}/\text{min}$ .

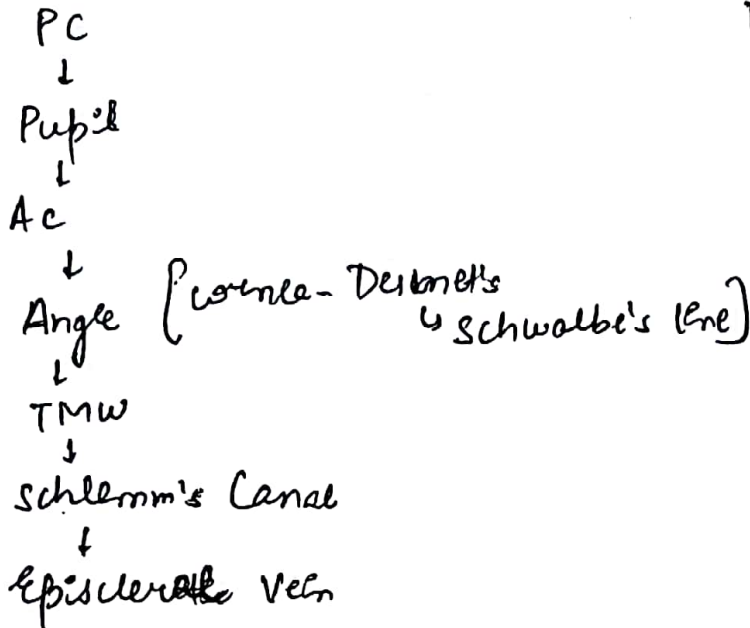
Hypersecretory Glaucoma  $\Rightarrow$  When more formation of AH.

$\downarrow$   
Due to Epidemic Dropsy. [TOXIN - SANGUINARINE]

# OUTFLOW OF AQUEOUS

41

CONVENTIONAL [90%]

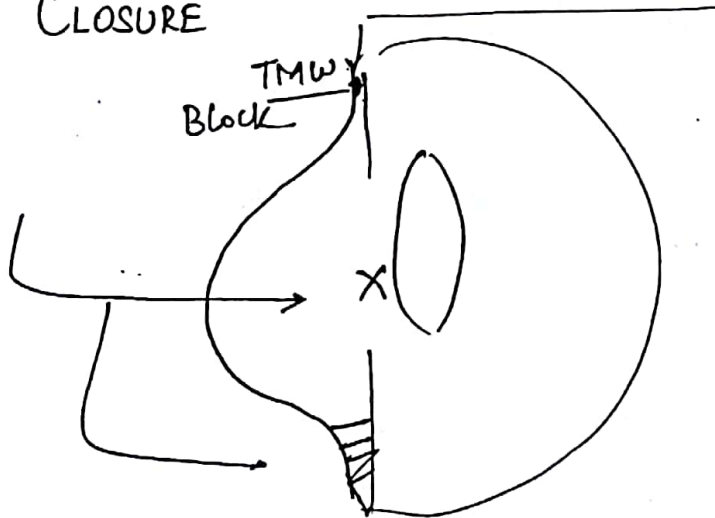


UVEO-SCLERAL [10%]

Directly crosses uveal tissue  
& sclera

## TYPES

ANGLE CLOSURE



OPEN ANGLE

More common

Block in Trabecular  
Network

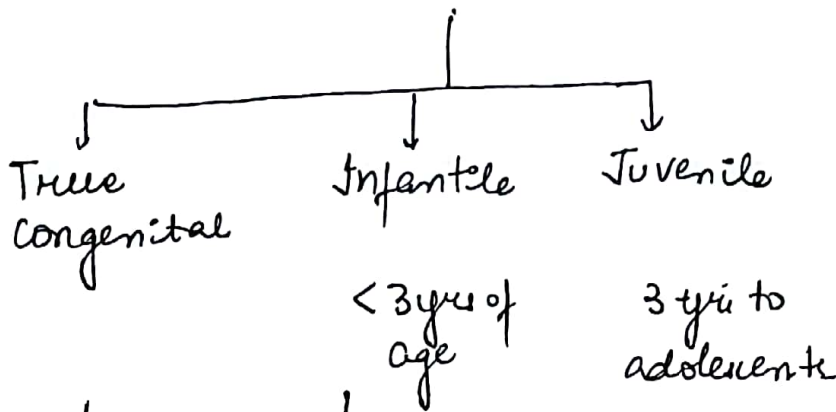
Obstruction at the pupil  
or actual obliteration  
of  $\angle$ .

Def<sup>n</sup>:- Glaucoma is multifactorial optic neuropathy  
associated w risk factors like increase IOP,  
+ve family history.

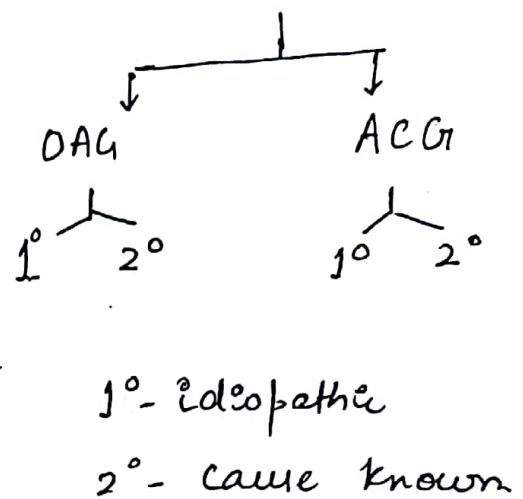
# CLASSIFICATION

42

## CONGENITAL / DEVELOPMENTAL



## ACQUIRED.



## BUPHTHALMOS

Due to enlargement of eyeball

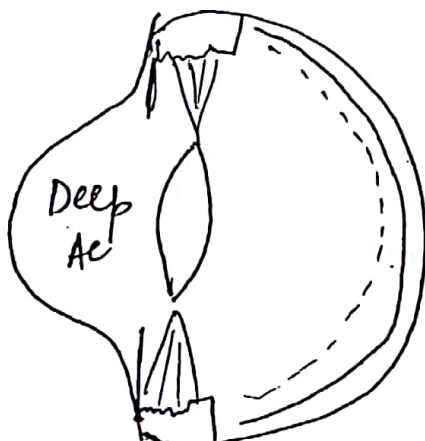
## 1° CONGENITAL GLAUCOMA

- Etiology -
- 1) Irabecular Dysgenesis
  - 2) Ab (N) Iris Insertion  $\Rightarrow$  FLAT IRIS / PLATEAU IRIS
  - 3) Barkan's Membrane at the angle

C/F-

- 1) Watering
- 2) Photophobia - intolerance to light
- 3) Blepharospasm

O/E.



- ① Large cornea
- ② White cornea due to corneal edema
- ③ Haabs striae - break in Descemet's Membrane
- ④ Irregularity - Tremulousness in IHC is due to loss of support from lens.



⑤ Flattening of Lens

⑥ Break in suspensory ligament  $\Rightarrow$  Subluxation of Lens

D/D - Megalocornea

⑦ Angle anomaly may be +nt:

⑧ Cupping of disc

T/t of choice

① TRABECULOTOMY

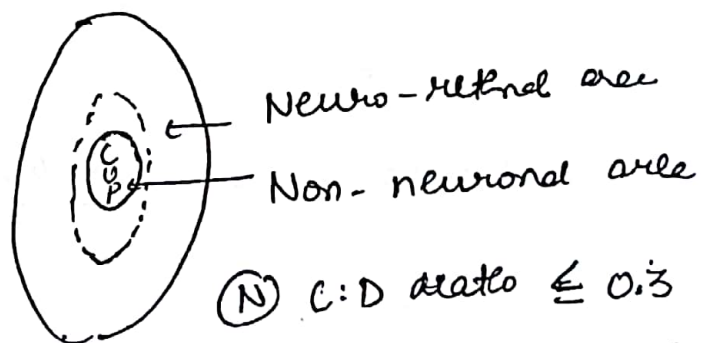
Cutting through the angle [Trabecular meshwork].

Trabeculotomy :- cornea when Hazy, Goniotomy can't be done  
Cut in TMW & Schlemm's canal

CUPPING OF DISC

① Optic Disc has central Pale area  $\Rightarrow$  CUP AREA

The area beside the CUP is Neuro-Retinal Rim.

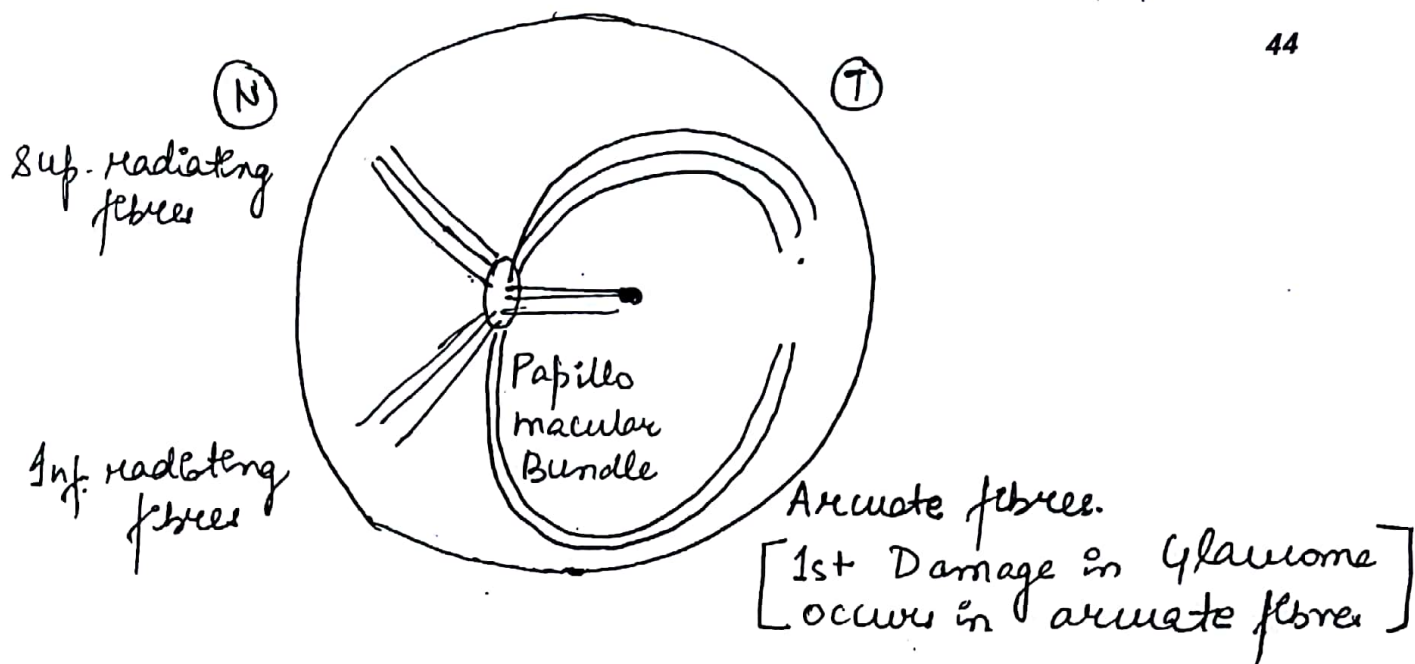


① C:D ratio  $\leq 0.3$

When C:D ratio  $\uparrow \Rightarrow$  Cupping.

Cupping  $\Rightarrow$  neuronal area is getting damaged  
Non-neuronal area is increasing.

In case of glaucoma cupping is vertically oval  
due to damage to arcuate fibres.



↓

1st Field Defect seen in

Bjerrum's Area

### BJERRUM'S AREA

Area in the Visual Field where 1st scotoma appears corresponding to arcuate fibres

### Physiological ~~Glaucoma~~ Cupping

① Horizontally round cup

② B/L symmetrical [Glaucoma is never B/L symmetrical]

### 2° CONGENITAL GLAUCOMA

#### ECTROPION UVEAE

Iris pigments everting from pupillary border

② Nerve of Oculodermal melanosis  
subepithelial conjunctival melanosis  
Associated to angle anomaly

### ③ Nano-ophthalmos

Very small eye

lens size may be normal

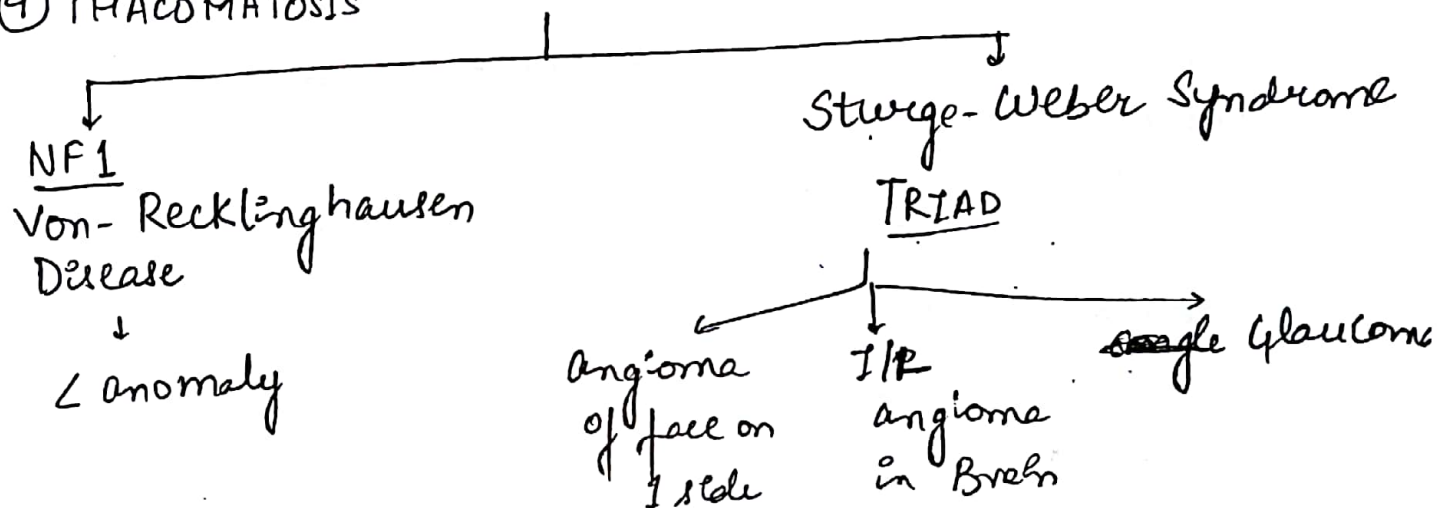
No other structural abnormality.

[In Micro-ophthalmos → structural abnormality are +ve]



angle may get obliterated.

### ④ PHACOMATOSIS



### 1° OPEN ANGLE GLAUCOMA.

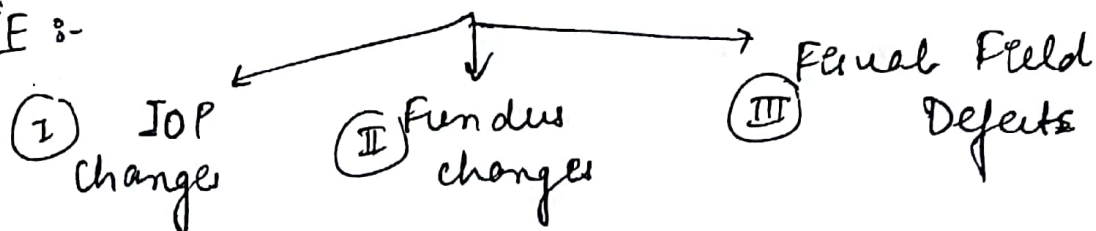
R/F :-

- 1) Age > 40 yrs
- 2) +ve Family History
- 3) High Myopia [ $> 6 D$ ]
- 4) DM.

Pathogenesis :-

Blockage in TMW

CF :-



### (I) IOP Changes

\* (N) IOP  $\rightarrow$  10-21 mmHg

\* Normal Diurnal Variation  $\sim$  5 mmHg  
 5-8 mmHg - suspicious  
 $> 8$  mmHg - glaucomatous.

IOP More in Morning as cortisol level are  $\uparrow$  in morning

\* NTG (Normal Tension Glaucoma) -

Normal IOP

Fundus changes (+)

Field Defects (+)

\* Ocular HTN -

IOP  $\uparrow$

Fundus (N)

No Visual Field Defects

IOP varies according to Central Corneal Thickness (CCT)

In thick cornea  $\rightarrow$  overestimate IOP.

In thin "  $\rightarrow$  underestimate IOP.

# TONOMETRY

47

INDENTATION

SCHIOTZ

APPLANATION

Fixed force

area  $\propto$  IOP

① MAKLAKOV T.

② BARRAQUER T.

Variable force

area is fixed

Force  $\propto$  IOP.

[Imbert-Fick Law]  
Most RELIABLE.

① GOLDMANN

② PERKINS

③ DRAEGER For Infants

for irregular  
cornea

④ TONOPEN

⑤ MAC KAY MARG

Non-contact

⑥ PULSAIR

⑦ AIR-PUPP T.

for self  
measurement

⑧ REBOUND

Q.  $\underline{C}$  is more Reliable?  $\Rightarrow$  Applanation.  
Bcoz reading of schiotz depends on scleral  
rigidity of pt.  
In myope  $\rightarrow$  scleral rigidity is less.

Q. Non-contact Applanation  
Air-Pupp  
Pulsair

Q. For self measurement  $\Rightarrow$  Rebound Tonometer



C tonometer used for scarred & irregular cornea<sup>48</sup>

① Tonopen

② Mac Kay Marg

For Infants -

① Tonopen

② Perken

Pascal's ~~To~~ Dynamic Contour Tonometer

- It is more reliable than Goldmann

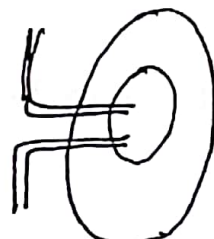
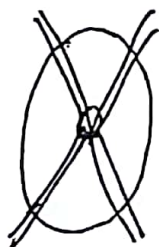
- Bcoz reading doesn't depend on CCT.

### TONOGRAPHY

measuring facility of aqueous outflow.  
used for research purpose.

### (II) FUNDUS CHANGES

- ① C:D  $> 0.3$
- ② Difference of C:D b/w 2 eyes  $> 0.2$
- ③ Notching of Neuro-retinal Rim.
- ④ Thinning of Neuro-retinal Rim
- ⑤ Laminar Dot Sign
- ⑥ Change in Blood vessels.  
a) nasal shifting of blood vessels.



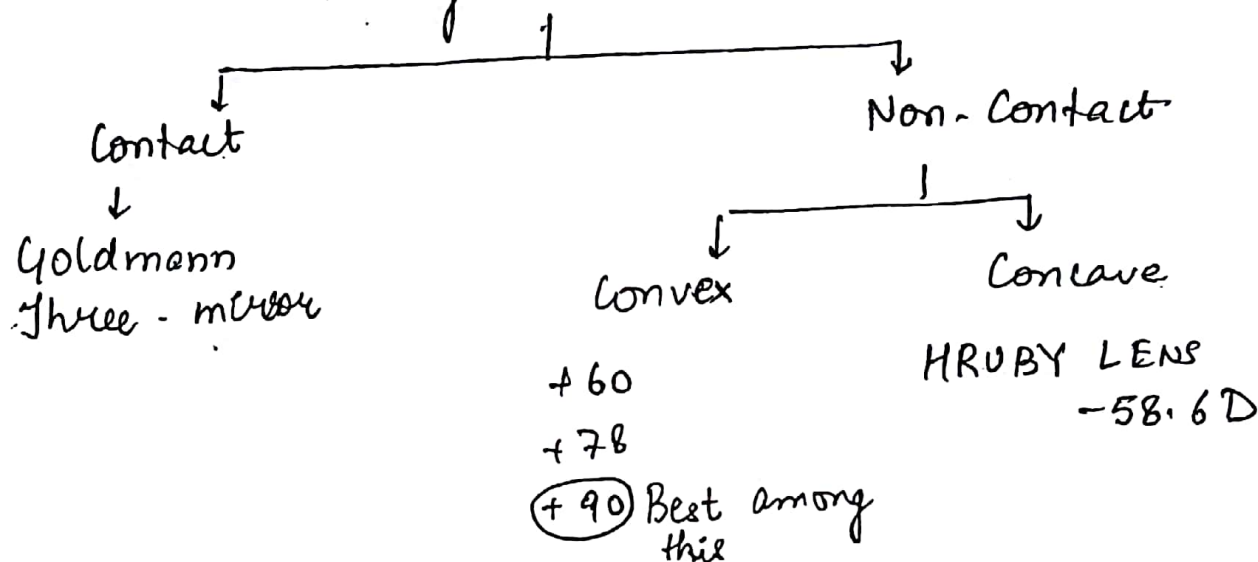
Nasal shifting

b) Bayonetting Sign.

sharp kinking & double bending of blood vessel.

Ideal Method → Slit Lamp Biomicroscopy

↓  
Putting lens in front of eye & then looking through slit-lamp.

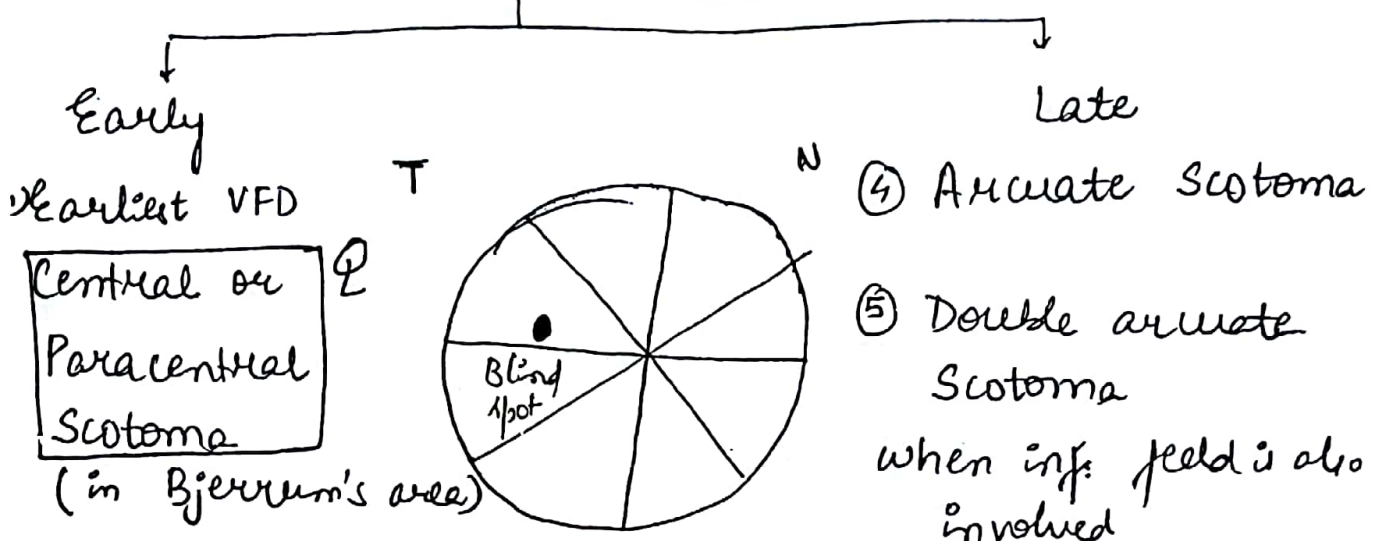


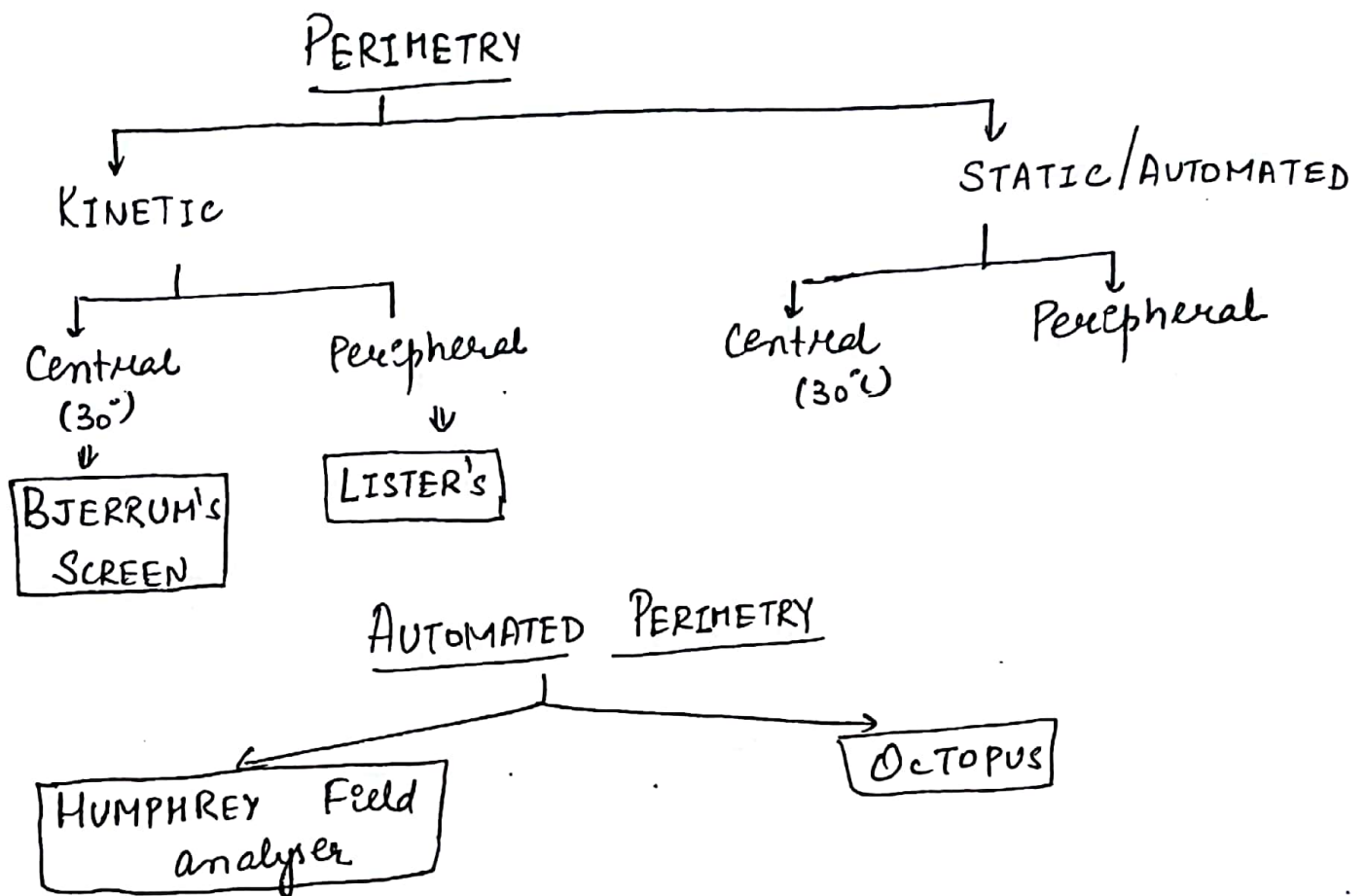
## (III) VISUAL FIELD DEFECT

(N) Extent → Temporal  $100^\circ$  or  $90^\circ$   
 Inferiorly  $70^\circ$   
 Nasally  $65^\circ$   
 Superiorly  $50^\circ$

Blind spot located between  $10^\circ$  -  $20^\circ$  isopter

VFD in 1° OAG





## 1° ANGLE CLOSURE GLAUCOMA

R/F :-

- ① Small eye
- ② Hypermetropia
- ③ Shallow AC.
- ④ Narrow angle
- ⑤ MC - ♀

Max. closure of angle occurs  $\Rightarrow$  when pupil is MID-DILATED.

CF

52

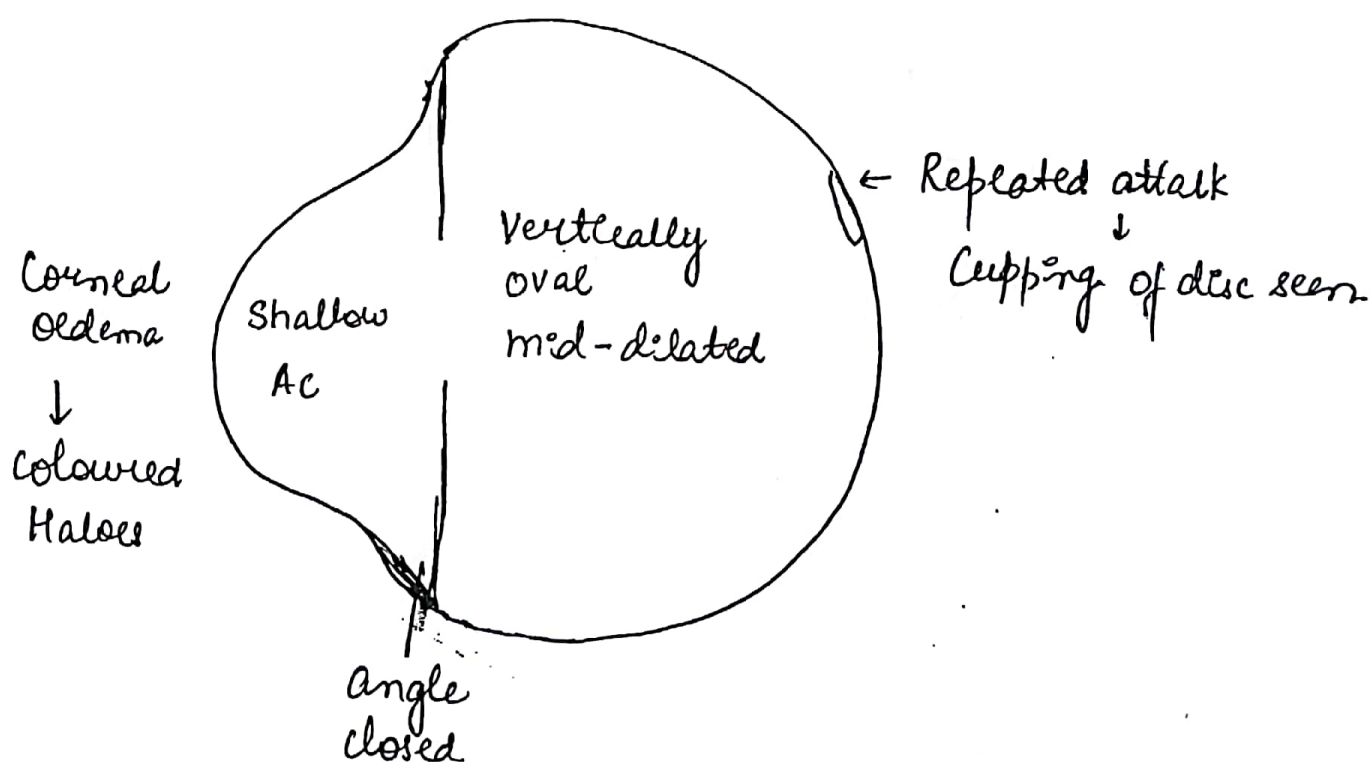
(I) → PRODROMAL  
Asymptomatic

(II) → STAGE OF CONSTANT INSTABILITY  
Some part of angle blocks & reopens by itself

(III) → ACUTE CONGESTIVE GLAUCOMA  
all  $360^\circ$  angle is closed.

IOP  $\sim 60$  mm Hg

Pain  $\uparrow\uparrow$ , associated  $\bar{c}$  nausea & vomiting  
Redness, Photophobia, Blepharospasm.



(IV) - CHRONIC CONGESTIVE GLAUCOMA

← IOP changes  
← Fundus changes  
← Field defects

+ Angles are closed

For Inv. to see angle  $\Rightarrow$  we need constricted Pupil



## ⑤ - ABSOLUTE GLAUCOMA

Painful Blind Eye.

IOP ↑↑↑

Stony Hard Eyes

100% Cupping



Glaucomatous optic  
atrophy

### TOC of Absolute Glaucoma

• Cyclotherapy

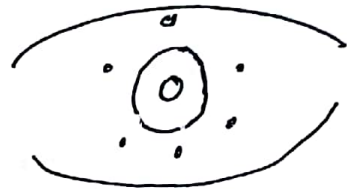


Damage few ciliary process

If excessive damage occurs by  
overtreatment



RA. PHTHISIS BULBI occurs



### OTHER MODALITIES OF T/t

a) Absolute Alcohol Injection → suppresses ciliary  
ganglion.

b) Enucleation

### Definitive T/t of ACG

Peripheral Iridotomy by Nd:YAG.

+

Prophylactic PI should be done in other eye.

OAG does not need any prophylactic T/t.

Doc for Angle Closure G/C ⇒ PILOCARPINE.

Doc for Acute Congestive Glaucoma ⇒ MANNITOL  
ACETAZOLAMIDE.

followed by pilocarpine

## 2° GLAUCOMA

54

### 1) LENS INDUCED GLAUCOMA

#### a) Phacolytic Glaucoma

It is the leakage of lens protein blocking the TMW.  
It is seen in Morgagnian Cataract

#### b) Phacotoxic Glaucoma

T → T

due to trauma

Any trauma causes capsular rupture

↓  
Lens protein blocking TM

↓

2° OAG.

#### c) Phacoanaphylactic Glaucoma

Lens protein

↓

Immune Reac<sup>n</sup>

↓

release of macrophages

↓

engulf lens protein

↓

Blocks the TMW.

↓

2° OAG.

Q.  $\bar{c}$  type of antigen is lens protein → Sequestered antigen

#### d) Phacomorphic Glaucoma

Due to morphology of lens

When intumescent cataract swells up.  
too much  $\bar{c}$

↓

Pupillary Block

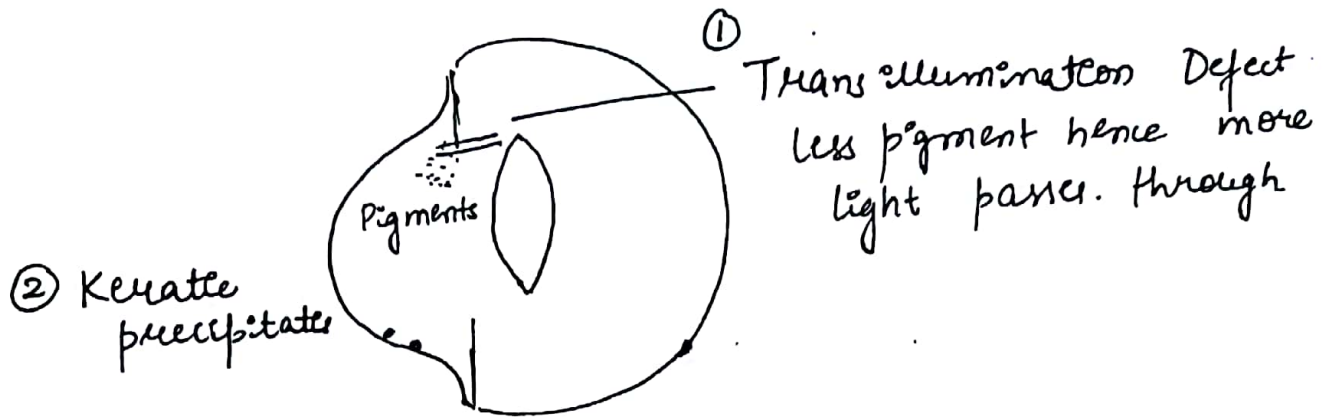
↓

2° ACG



## 27 PIGMENTARY GLAUCOMA

55



Release of pigments  
↓  
Blocking TM.

KP → spindle shaped  
Krukenberg spindles

## 3) PSEUDOEKFOLIATION SYNDROME / GLAUCOMA CAPSULARE

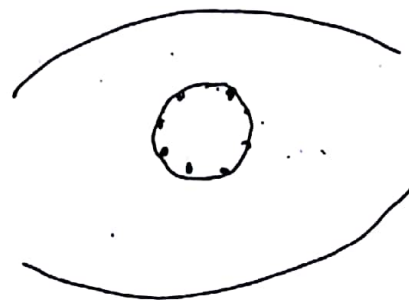
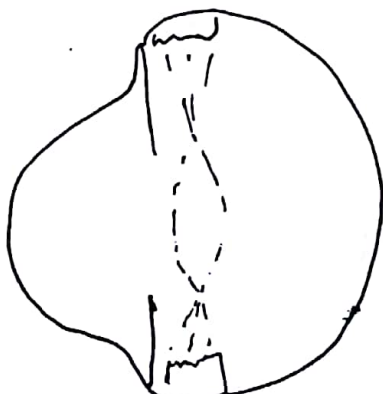
Dandruff like material is released from lens  
capsule x suspensory ligament

↓  
released into aqueous

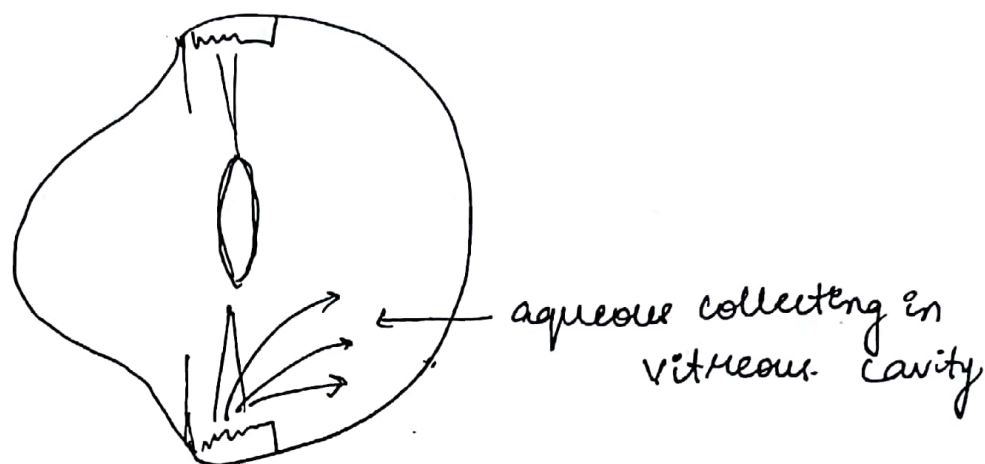
↓  
Blocking TM.

Not true exfoliation exfoliation ⇒ proteinaceous secretion.

H/c 2° Glaucoma



#### 4) MALIGNANT GLAUCOMA / CILIARY BLOCK GLAUCOMA<sup>56</sup>



Aqueous formed collects in vitreous cavity

↓  
Lens & Iris pushed forward

↓  
very shallow AC

Cause:- It occurs after any intraocular Sx

↳ Surgery chances of malignant glaucoma more  
Trabeculectomy

Mx

1) Atropine - 1st Line T/t.

strongest cycloplegic.

Dilatation also opens the block.

2) Nd:YAG anterior hyaloidotomy

aqueous starts leaking anteriorly

↓  
block opens.

3) Paras plana Vitrectomy

cutting out aqueous from vitreous

## Inverse Glaucoma

57

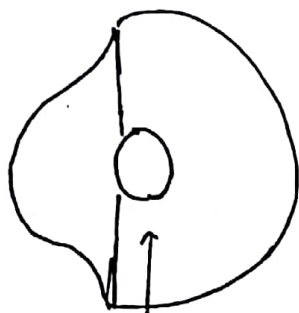
Glaucomas' t/d by Mydriatic

Eg. 1) Malignant Glaucoma

2) Spherophakia

↓  
spherical lens blocks the pupil

↓  
& t/d by Mydriatic



spherical lens

## 5) NEOVASCULAR GLAUCOMA

Cause: Hypoxia in retina

↓  
neovascularisation.

↓  
If hypoxia is not t/d.  
Ant. Segment also hypoxic

↓  
Rubeosis Iridis

New blood vessels are more leaky & have fibrous tissue also.

So, initially it is OAG.

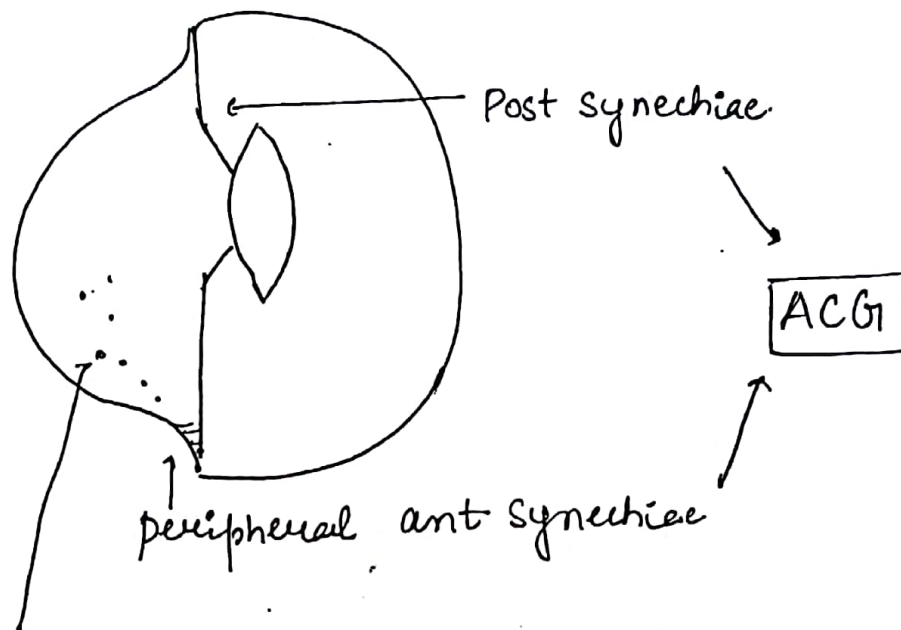
↓  
Later associated fibrous tissue contracts.  
leading to angle closure

↓  
ACG



- TOC 1) Pan retinal Photocoagulation.  
2) Anti-Glaucoma Drugs

## 6) GLAUCOMA ASSOCIATED WITH UVEITIS



When aqueous cells block TMW  $\Rightarrow$  OAG.

Glaucomatocyclitic crisis / Hypertensive Uveitis /  
Posner-Schlossman Syndrome.

In uveitis, pupil is miotic. ACG pupil  $\rightarrow$  mid-dilated or Dilated.

$\uparrow$   
This helps in diagnosis of this syndrome

TOC

- 1) Anti-Glaucoma Drugs
- 2) Atropine  
for uveitis

When pressure is controlled  $\Rightarrow$  go to steroids

## 7) STEROID INDUCED GLAUCOMA

M/c ocular complication of topical steroids.

Deposition of Mucopolysaccharides in TMW.

↓  
OAG.

## 8) ICE Syndrome [Iris-Corneo-Endothelial Syndrome]

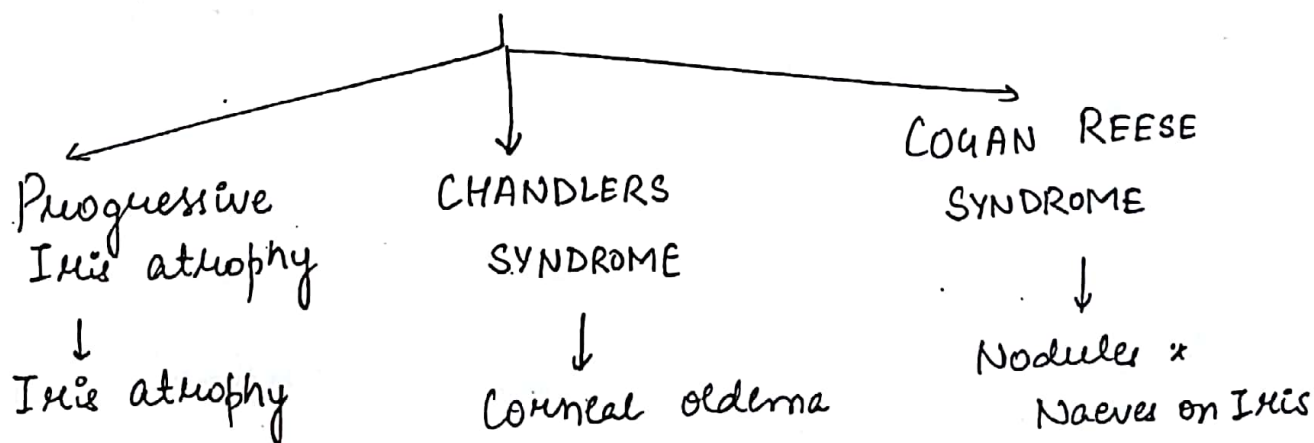
Endothelial never regenerates (N)

In this syndrome,

endothelium starts proliferating

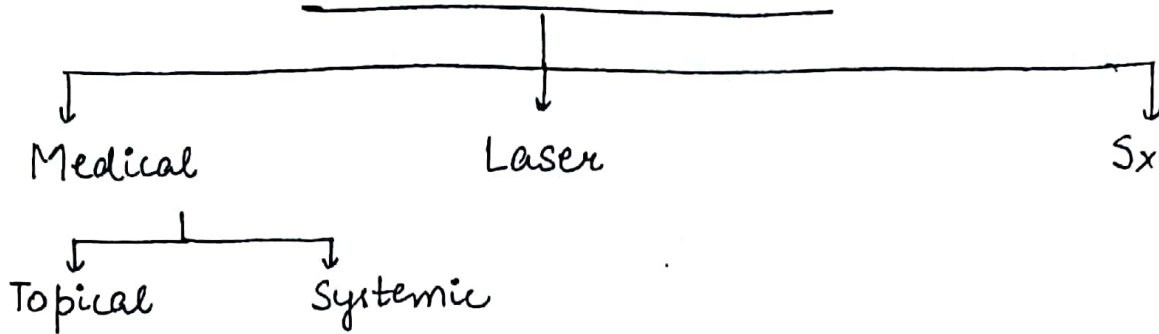
↓  
Block's angle

**Proliferative endotheliopathy + 2° Glaucoma**



# Rx OF GLAUCOMA

60



## TOPICAL DRUGS

### 1) $\beta$ BLOCKER

MOA -  $\downarrow$  formation

Eg - TIMOLOL

BETAXOLOL

LEVOBUNALOL

Q. c/I in  $\beta$  blocker = asthma

Selective  $\beta$  blocker = Betaxolol

$\subseteq$   $\beta$  block causes  $\bullet$  NLD obstruction = Timolol

### 2) $\alpha$ -AGONIST

MOA - Dual action

$\downarrow$  formation

$\uparrow$  drainage  
[uveoscleral outflow]

Preferred

Eg - EPINEPHRINE / ADRENALINE

DIPIVEFRINE

BRIMONIDINE

APRACLOnidine

$\alpha$  agonist CI - HTN  
Heart Disease

61

Selective  $\alpha$  agonist - Brimonidine  
Apraclonidine

c anti glaucoma Drug causes browiness = Brimonidine

c " " CI in Infants = Brimonidine

conjunctival pigmentation  $\rightarrow$  by adrenaline  
can cause cns depression

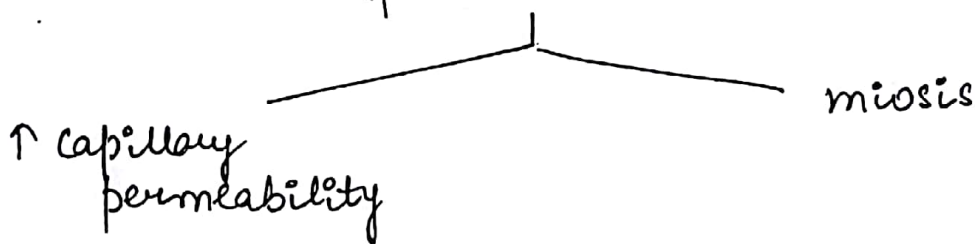
### 3> MIOTICS

MOA -  $\rightarrow$   $\uparrow$  conventional outflow [trabecular] Q.

2> Miosis in ACG opens up angle.

Eg Pilocarpine  $\downarrow$  uveoscleral outflow.

$\rightarrow$  CI in pts of uveitis becoz miosis aggravates inflammation



### 4> PROSTAGLANDIN ANALOGUE [PG F<sub>2</sub> agonist]

MOA -  $\uparrow$  uveoscleral outflow.

Eg - LATANOPROST

BIMATOPROST

TRAVOPROST

c Drug causes Heterochromie Iris - Latanoprost

Becoz it causes IRIS Pigmentation

C Antiglaucoma drug  $\uparrow$  (B) outflows = Bimatoprost.

c/I in uveitis as they are mediators of inflammation.

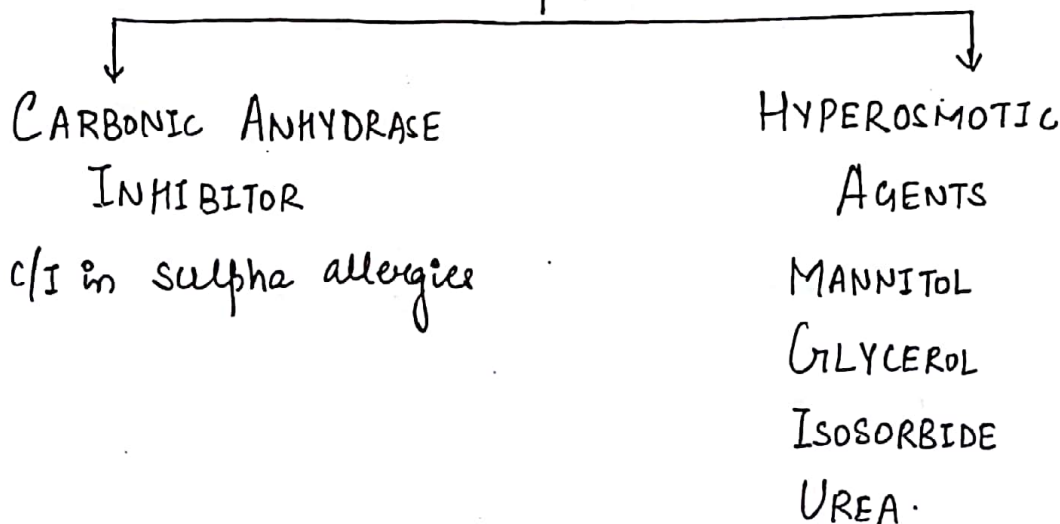
## 5> CARBONIC ANHYDRASE INHIBITOR

MoA -  $\downarrow$  formation of aqueous humour

Topical CA inhibitors = DORZOLAMIDE  
BRINZOLAMIDE

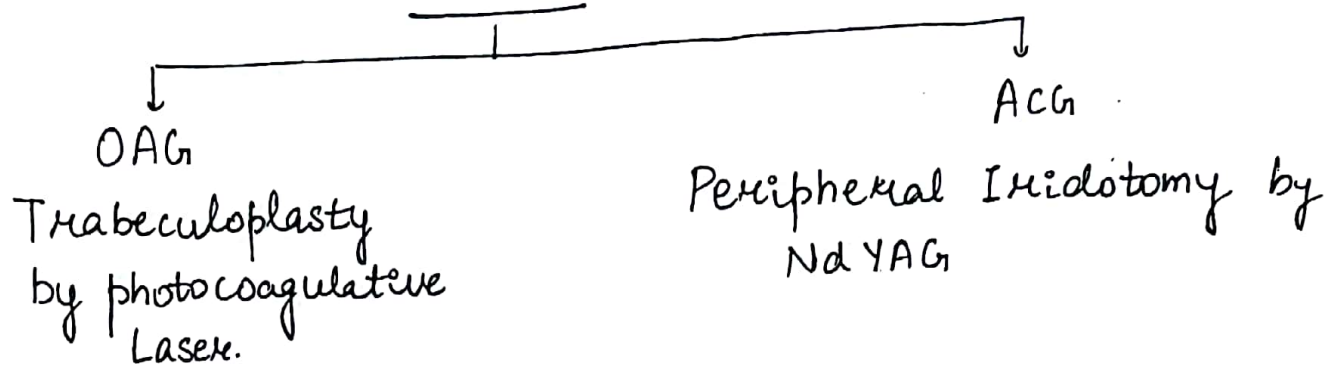
c/I in sulpha allergies

## SYSTEMIC DRUGS





# LASER



## Sx

### 1> GONIOTOMY

Cut in TMW  $\Rightarrow$  Tx of Congenital Glaucoma

### 2> TRABECULOTOMY

Cong. Glaucoma

When cornea is not clear.

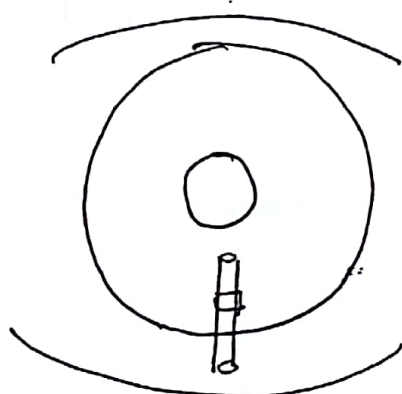
Cut in TMW + Schlemm's Canal.

It is <sup>also</sup> done along  $\bar{c}$  Trabeculectomy.

### 3> TRABECULECTOMY

Cutting TM

↓  
Direct connec<sup>n</sup>



## Resection of TM

↓  
making a fistula bet<sup>n</sup> AC & P Subconjunctival space

↓  
Direct connection.

Steps :-

Constricted Pupil

↓  
Cut Conjunctiva & make a flap.

↓  
resect tenon's capsule

↓  
on sclera. → V-shaped partial cut

↓  
directing

↓  
On Limbus. cut a block of TM

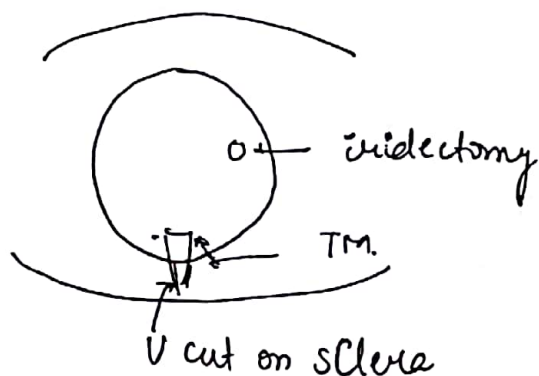
↓  
Do iridectomy

↓  
Put flap & loosely

Suture it.  
↳ so that aqueous flow.

BLEB - Conjunctival flap is held due to aqueous flow underneath.

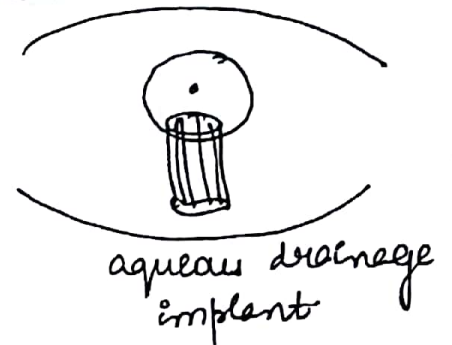
↑ rise of bleb indicates success of process.



## PRECAUTION for closure of fistula

Anti-Mitotic Drugs  
 Mitomycin c      5FU

5FU



## Aqueous Drainage Implants

### 1) MOLTENO IMPLANT (older)

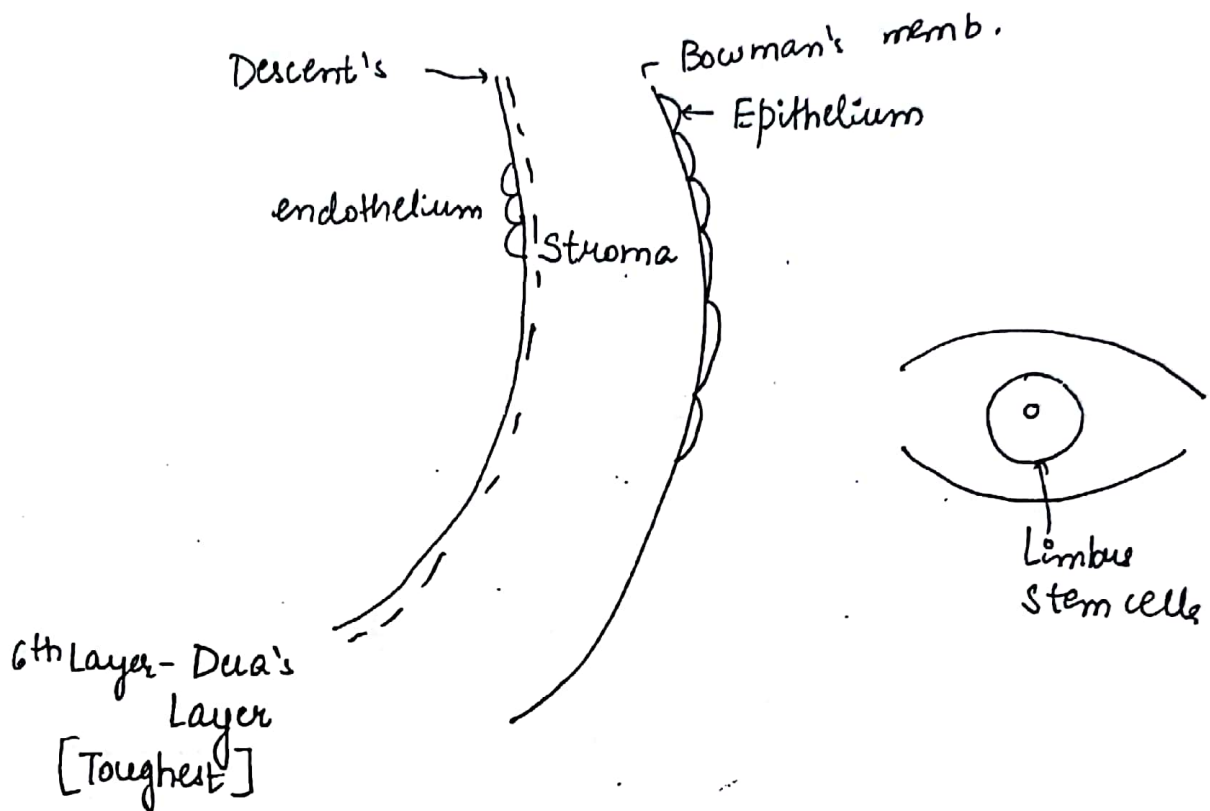
It causes hypotony. [IOP < 10 mmHg]  
 made up of ~~the~~ polypropylene

### 2) AGV (Ahmed Glaucoma valve) made up of silicon.

### 3) EXPRES IMPLANT made up of stainless steel.

# CORNEA

## STRUCTURE OF CORNEA



Epithelium grows from Limbus stem cells

## PHYSIOLOGY

- 1) Avascular
- 2) 1<sup>o</sup> metabolism  $\Rightarrow$  AEROBIC
  - $O_2$  from air
  - Nutrition from aqueous humour
- 3) Dehydrated
  - ↳ Endothelium act as barrier
  - ↳ Pump function :-  $Na^+ K^+$  ATPase pump
    - ↳ continuously pumps out water.

(N) No. of endothelial cells.

adult - 2500-3000 cells/mm<sup>2</sup>.

children - 3500-5500 cells/mm<sup>2</sup>.

Polymegathism

whenever endothelial cells damage  
compensatory change occurs in size  $\Rightarrow$  size enlarge.

Pleomorphism

Morphological change in shape when endothelial cells get damaged.

When Total No. of cells  $< 500$  cells/mm<sup>2</sup>  $\Rightarrow$  Further No compensation.

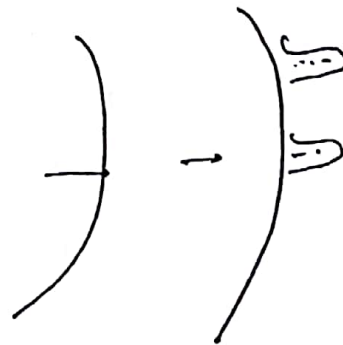
$\Downarrow$   
Pump function  $\downarrow$   
 $\downarrow$   
Hydration.

$\downarrow$   
initially Stromal edema  
later epithelial "

$\downarrow$   
Bulky filled w fluid

$\Downarrow$   
BULLOUS KERATOPATHY

It is a sign of corneal decompensation.





Metabolically Most Active Layer = ENDOTHELIUM 68

   layer is involved in Bullous Keratopathy = EPITHELIUM.

   are layers of cornea & do not regenerate

1) ENDOTHELIUM

2) BOWMAN'S MEMBRANE

## FACTORS RESPONSIBLE TO MAINTAIN TRANSPARENCY

1) Regular arrangement of epithelium

2) " " of stromal lamella

Distance bet<sup>n</sup> 2 lamella  $< \frac{1}{2} (\lambda \text{ of light})$ .

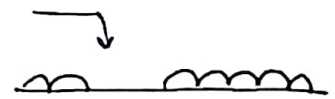
3) Dehydration

$\left\{ \begin{array}{l} \text{Pump func}^n \\ \text{Barrier} \end{array} \right\}$  of endothelium.

4) Avascularity

## ULCER

Breach in the continuity of epithelium.



ORGANISMS & PENETRATE INTACT EPITHELIUM.

NNLDH

N - Neisseria Gonorrhoea

N - " Meningitis.

L - Listeria

D - Diphtheria

H - Haemophilus

## INV. RELATED TO CORNEA

① Keratometry      measure curvature of cornea  
Scanning central part

② Corneal Topography  
Curvature of cornea measurement  
Scan whole cornea

③ Pachymetry  
Thickness measurement  
(N) 0.5-0.6 mm (centre)  
at Limbus - 1 mm.

④ Speculomicroscopy ①  
Examine endothelial cells [Both No. & Morphology]

⑤ Corneal Sensation  
ASTHESIOMETER - hair like project & toucher  
corneal surface.

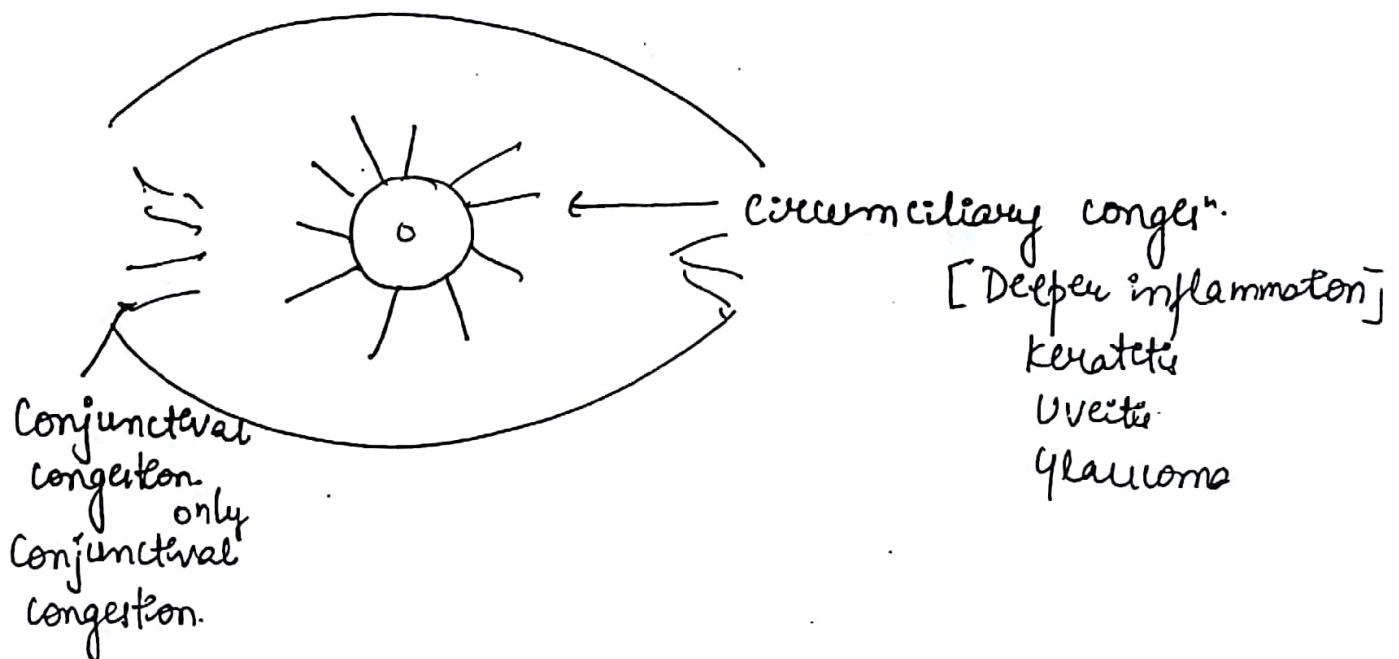
⑥ Microbiological  
    — staining  
    — culture

# KERATITIS

Inflammation of Cornea.

- Pain
- Redness
- Photophobia
- Blepharospasm
- D/c

## REDNESS

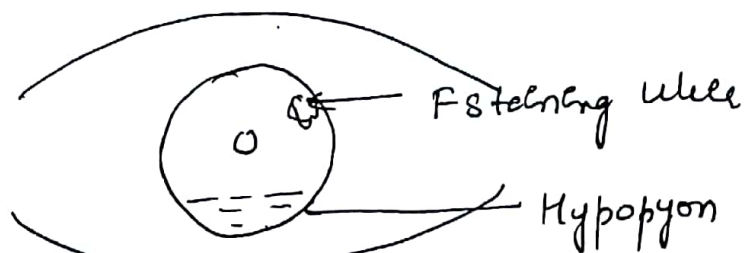


## BACTERIAL KERATITIS

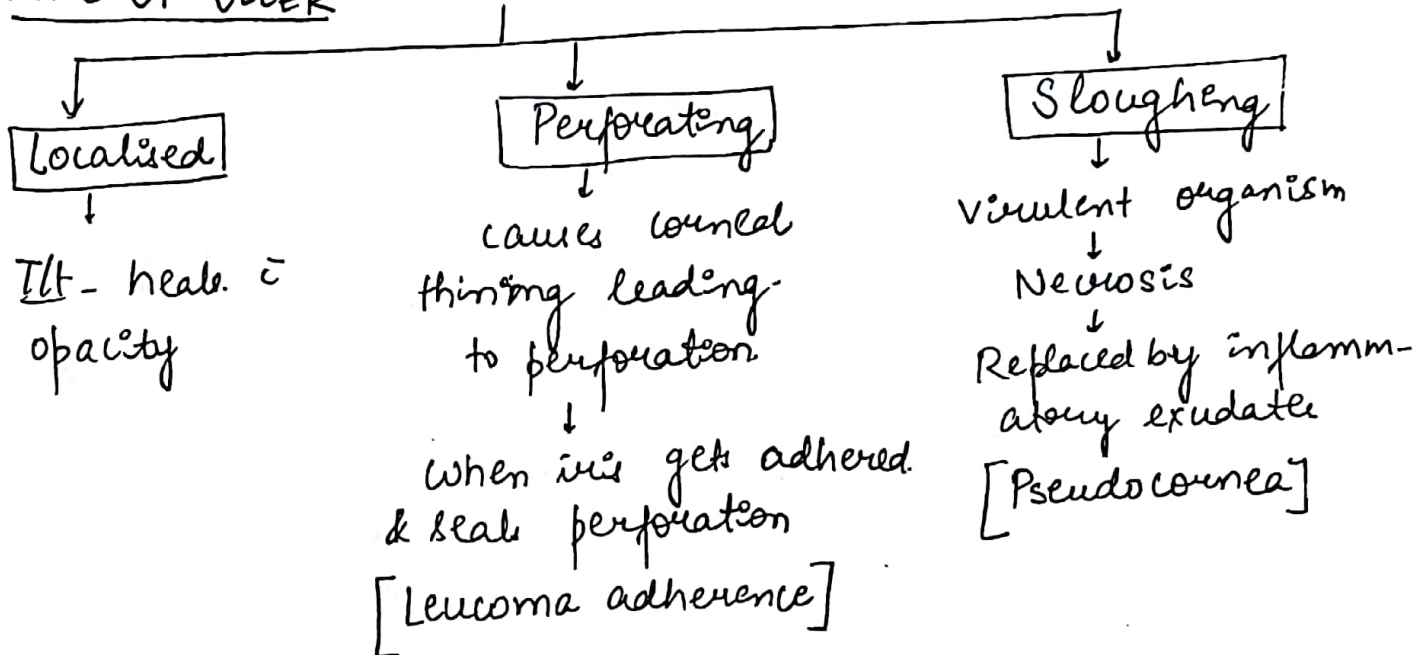
Presents  $\bar{c}$  (5) above features

O/E  $\rightarrow$  Fluorescein stained +ve ulcer

Pus in AC [Hypopyon]  $\rightarrow$  Sterile



### FATE OF ULCER



**Hypopyon Corneal Ulcer** :- PNEUMOCOCCUS  
or  
**ULCUS SERPENS**

Rx  
17 Antibiotics — Broad spectrum  
culture sensitivity

27 Fortified antibiotic drops  
CEFAZOLINE → 50 mg/mL  
GENTAMYCINE → 15 mg/mL

37 Antibiotic Ointment applied - HS

47 Atropine.  
since Keratitis may cause uveitis.

5) Oral Anti-inflammatory

72

6) Oral Vit A/Vit C

For any infective corneal ulcer

- NO steroids
- NO Bandage
- ↓
- Flapping

### Rx of NON-HEALING ULCER

#### 1) Debridement

Remove necrotic tissue from periphery using sterilised cotton bud

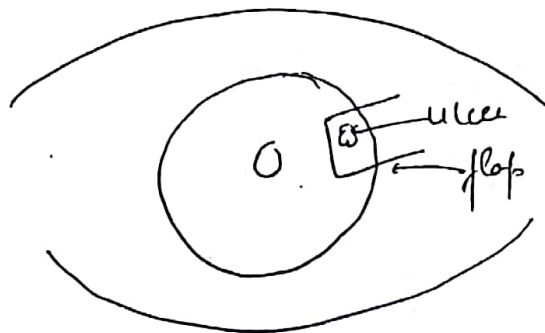
#### 2) Chemical Cauterisation

TCA (trichloroacetic acid)

↓  
local antiseptic effect

#### 3) Conjunctival flapping

raise a flap of conjunctiva + cover the ulcer  
Gundersen's Conjunctival flapping



### Rx of IMPENDING PERFORATION

1) Anti-Glaucoma Drugs.  
↓ IOP

2) Cyanoacrylate Glue application on thin area.



③

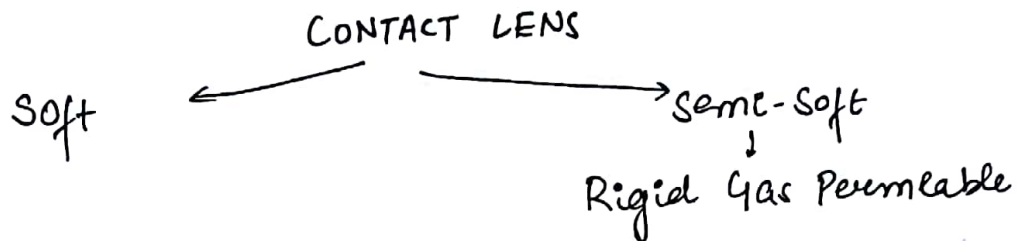
Bandage Contact Lens

Soft lens

High water content

More  $H_2O$  → More  $O_2$  transfer ability

73



## FUNGAL KERATITIS / KERATOMYCOSIS [AIIMS]

CAUSE - Trauma by Vegetative matter  
common in farmers

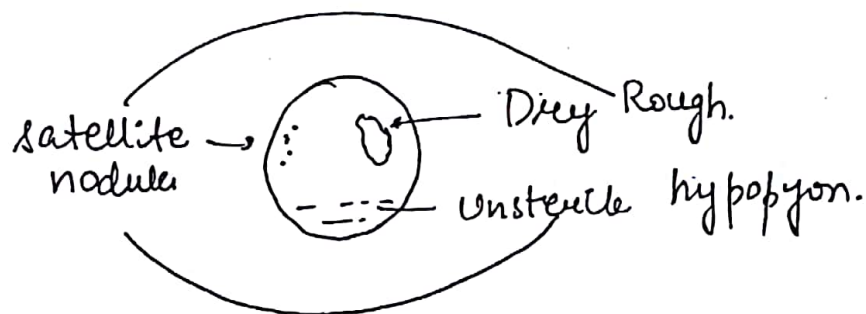
Signs are more than symptoms compared to bacteria

M/c Fungus ⇒ ① ASPERGILLUS FUMIGATUS Q  
② FUSARIUM Q.

M/c Fungus infecting kids → Candida albicans

C/F:- 5 features

O/E → 1) Ulcer is dry & rough.  
2) Projecting ends → HYPHAE



3) Unsterile Hypopyon.

4) Satellite nodules Q

Inv.

74

Staining

Culture

1) KOH Smear

2) Gomori's Methamine  
Silver Stain.

Keratitis caused by NOCARDIA  
bacteria closely resembles ASTEROIDES, & is a filamentous  
FUNGAL CORNEAL ULCER oo

R<sub>x</sub>

DOC → NATAMYCIN

Other - Nystatin eye ointment

Fluconazole → Most effective against Candida

## VIRAL KERATITIS

is more common = Herpes Simplex M/c  
than Herpes Zoster.  
Ophthalmicus

Pathognomic feature  
↓ corneal sensation.

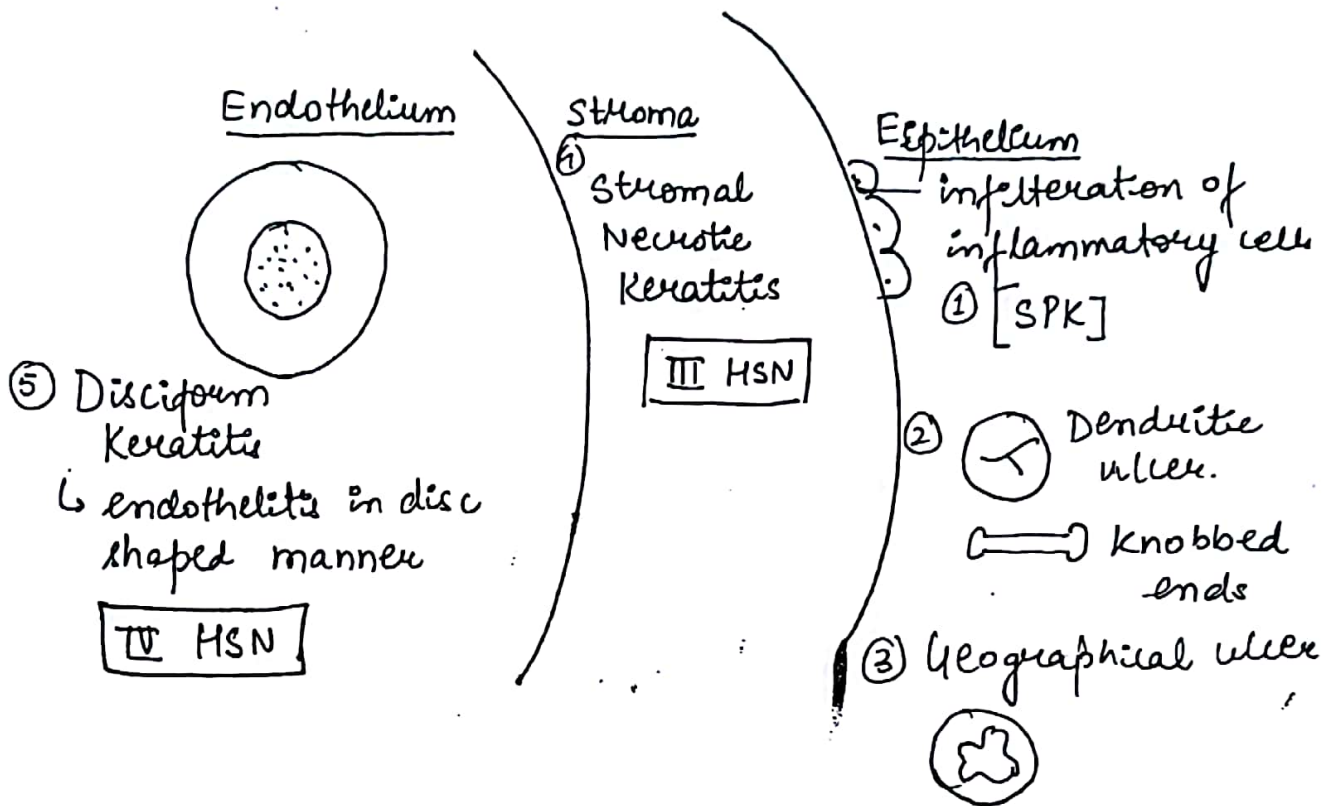
### CAUSES OF ↓ CORNEAL SENSATION

- 1) Leprosy
- 2) DM
- 3) Absolute Glaucoma
- 4) Pthiasis Bulbi
- 5) any chr. degenerative disease  
of cornea
- 6) Section of trigeminal n/v
- 7) Viral keratitis

# HERPES SIMPLEX KERATITIS

75

O/E :-



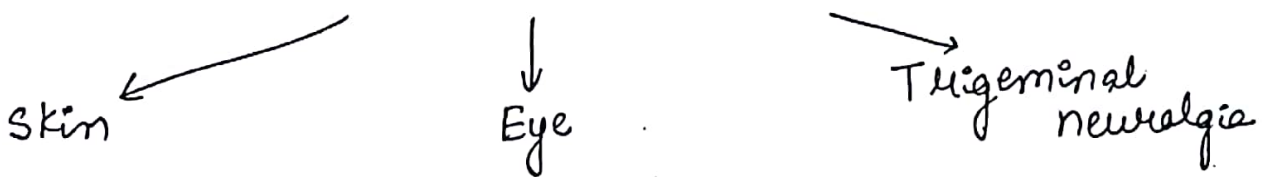
Stromal Necrotic Keratitis & Disciform keratitis may be a manifestation of HSN Rec<sup>n</sup>.

Rx :-

175/ Acyclovir Eye Ointment - 5 times/day. [acyclovir drops not available]

✶ Ideal duration - not exceeding 14 days.

## HERPES ZOSTER OPHTHALMICUS



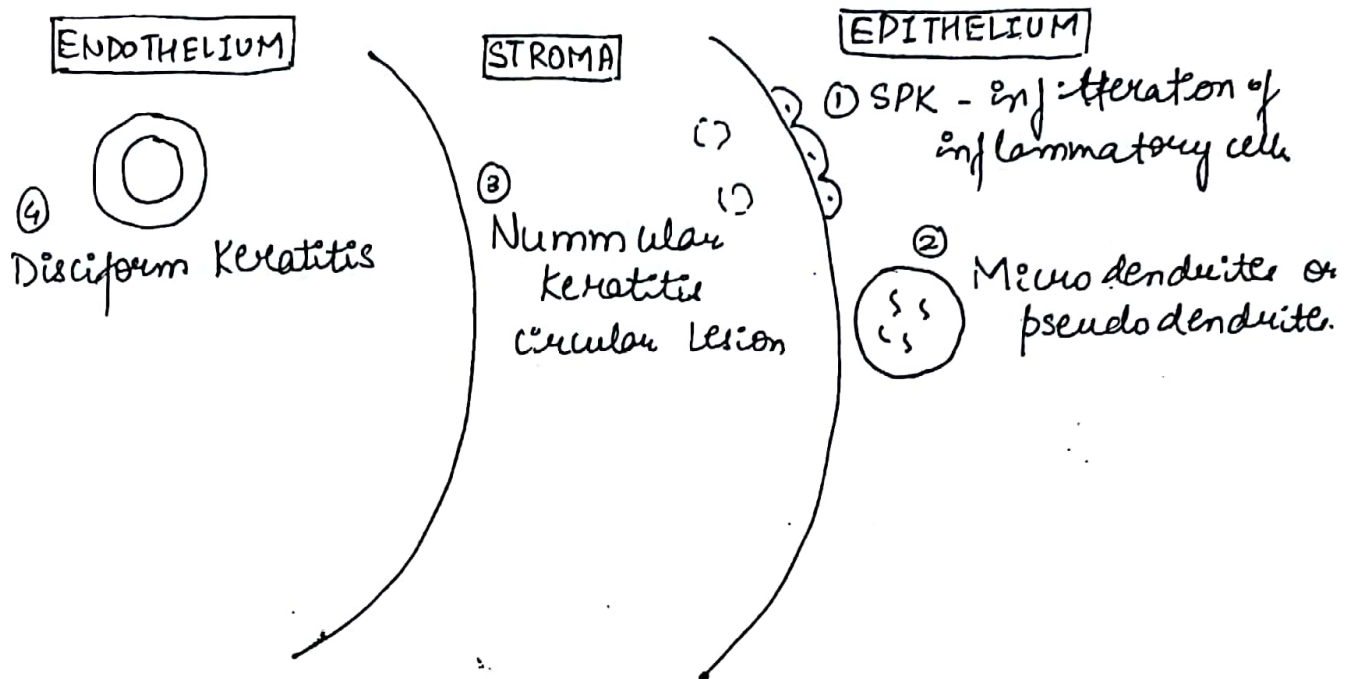
**Hutchinson's Rule** :-

If tip of nose is involved, eye will be involved.  
Indicates involvement of Nasociliary N/V

C/E :- (5) some severe inflammation.

76

O/E :-



(5) Uveitis

(6) Cranial n/v Palsies

(3) 4, 6  
M/c

M/c N/v involved in Zoster = **FRONTAL N/v**

Rx:-

1) Topical is same

3% Acyclovir eye ointment - 5 times/day

2) Oral Acyclovir

(800mg) tab

- 5 times/day

3) Valacyclovir

(1000mg) tab

3 times/day

} till 14 days.

Metaherpetic Keratitis -

Over t/t is

antivirals.

Toxicity

→ T/t

- ① Stop antivirals

② start Lubricating eye drops



# ACANTHAMOEBA KERATITIS

77

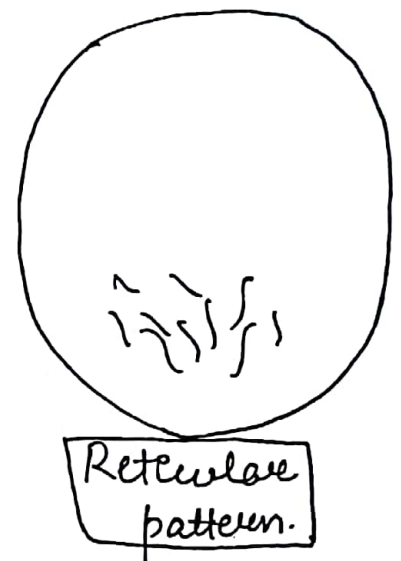
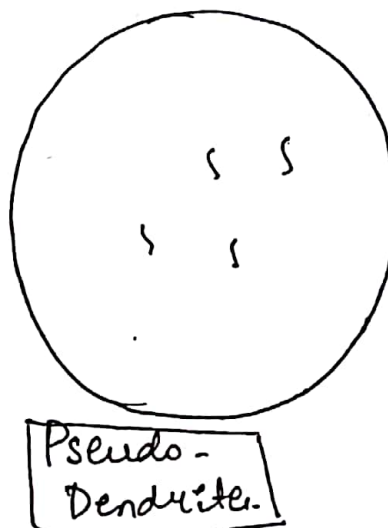
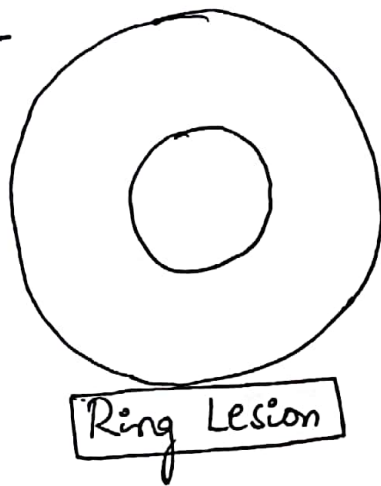
Rare infection

Cause:- 1) users washing soft contact lens in tap water  
2) swimming in pool goggles in soft contact lens user

C/F- ⑤ Same

Pain is disproportionately much more  
↳ due to perineural invasion.

O/E-



Inv:-

staining

- 1) Calcofluor white
- 2) Acridine orange
- 3) Lactophenol Blue.

culture

Q. Q. Non-nutrient agar & E. coli

Rx:-

1) PHMB [Poly Hexa Methylene Biguanides]

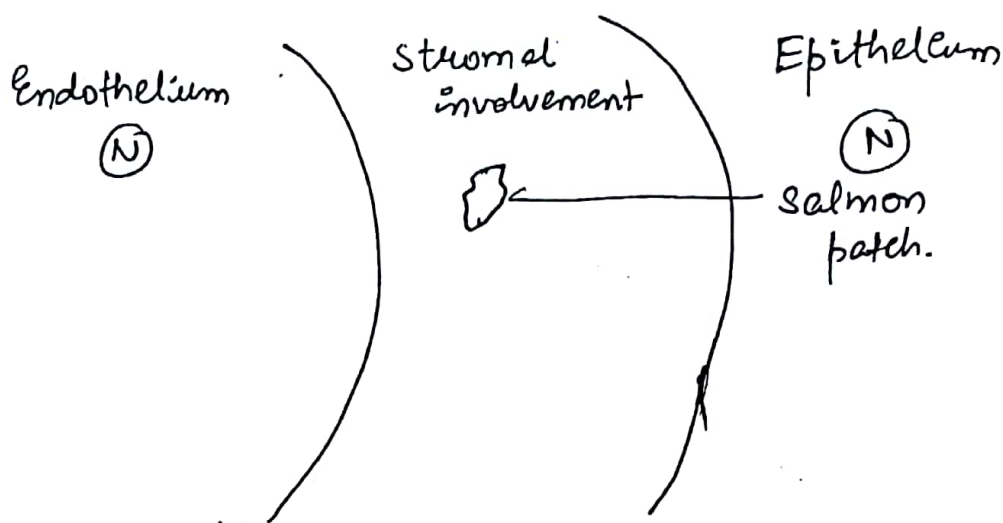
2) Propamidine isethionate

3) Neomycin.

DOC → PHMB



# INTERSTITIAL KERATITIS



Causes :- 1) Syphilis

2) Leprosy

3) TB

4) Sarcoidosis

5) COGAN SYNDROME → IK + Deafness

Other causes- 1) Acanthamoeba  
2) Herpes simplex  
3) Herpes zoster

Not a feature of Chlamydia

SALMON PATCH → is a feature of Syphilis

# KERATOCONUS

79

- Ectatic Dystrophy of Cornea characterised by Corneal protrusion.

Also

Dystrophy is idiopathic spontaneous change  $\bar{c}$  no inflammatory component

- Genetic Disease : AD
- Slowly Progressive

If whole cornea is protruded out = Keratoglobus  $\rightarrow$  Myopia.

In Keratoconus  $\rightarrow$  Myopia + Irregular Astigmatism.

$\downarrow$   
Pt complains of Diminution of Vision.

O/E :-

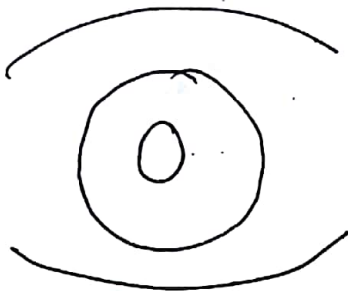
- 1) Fleischer's Ring  
Fe Deposition in Epithelium
- 2) MUNSEN'S SIGN  
V shaped deformity of lower lid on downgaze
- 3) CORNEAL TOPOGRAPHY  
 $\rightarrow$  irregular astigmatism.
- 4) RETINOSCOPY  
 $\rightarrow$  scissor's reflex. Q.
- 5) Prominent corneal n/r  
 $\hookrightarrow$  it is due to thinning of cornea
- 6) Vogt's Striae  
Break in Descemet's membrane in keratoconus  $\rightarrow$  parallel to steeper axis.

Thickening of Corneal N/V

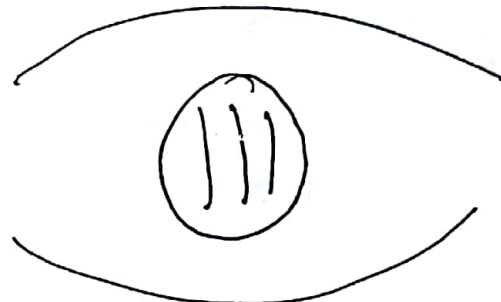
- 1) Leptosy
- 2) NF-1

3) 1

Q How to differentiate bet<sup>n</sup> Haab's & Vogt's striae?



Haab's - Circular



Vogt's = Vertical

R<sub>x</sub>:-

- 1) Spects  
in early stage. effective
- 2) Contact lens

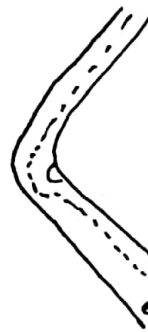
Rigid Gas Permeable  
lens



③

C<sub>3</sub>R

Corneal collagen cross-linking  
- Riboflavin



← rigid gas permeable

expose the eye to UV-A rays for 30 minutes.

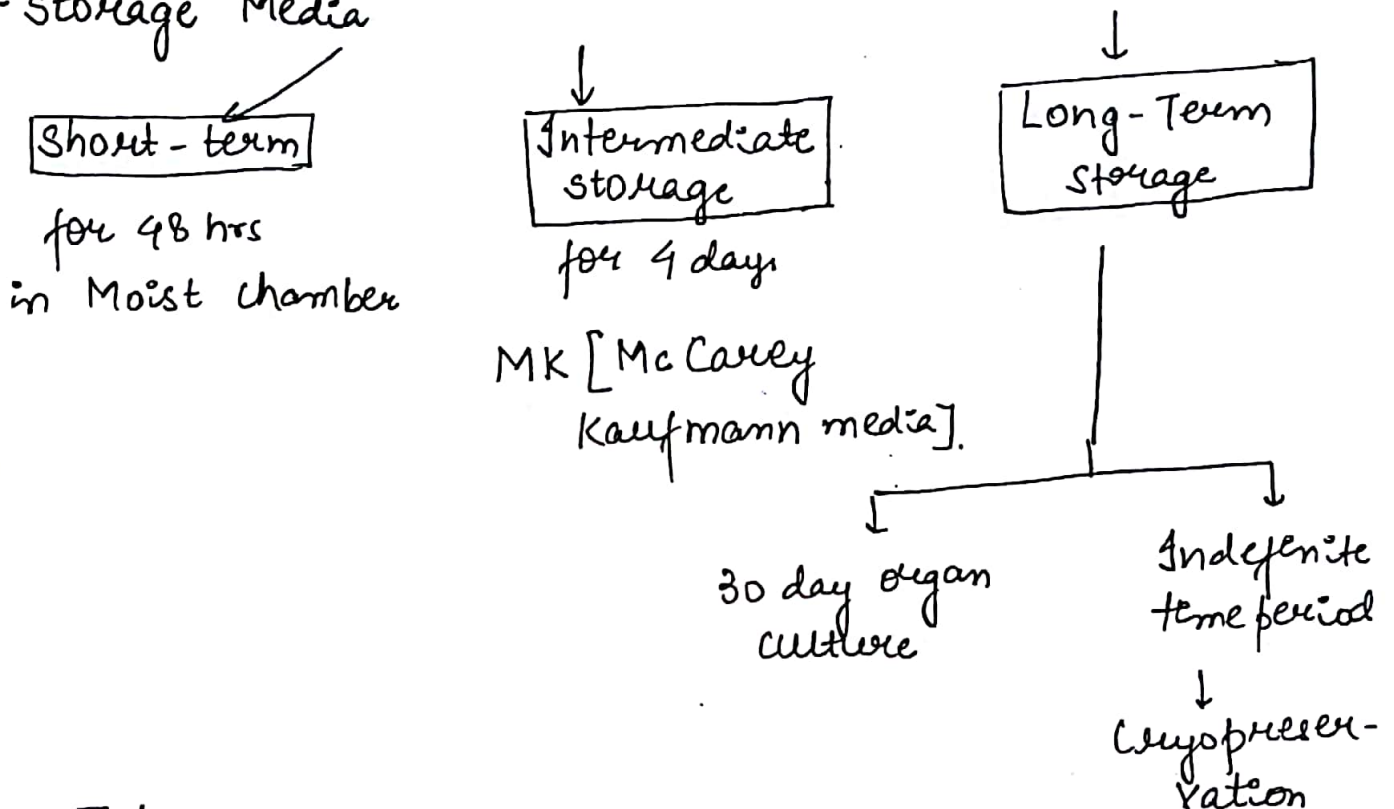
↳ it arrests progression of disease

4) Penetrating Keratoplasty (PK)

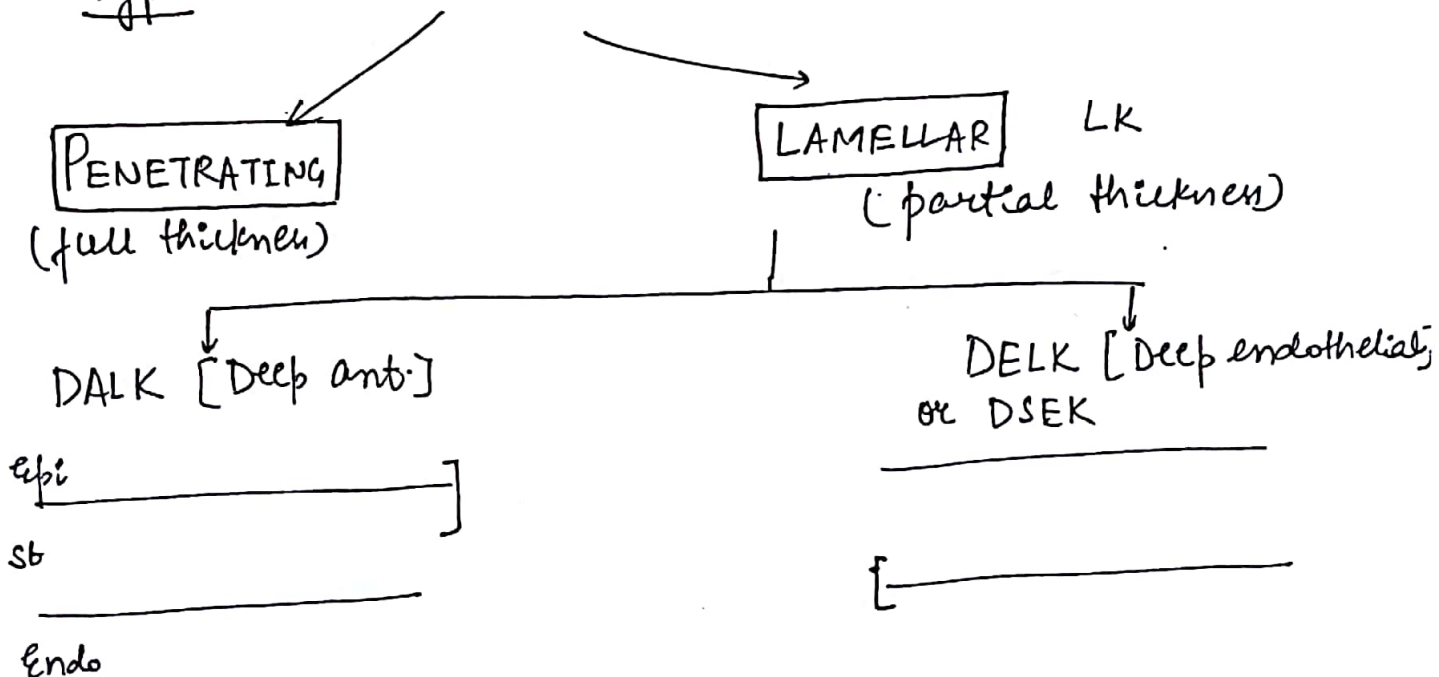
# Keratoplasty

81

- Corneal Transplantation (Donor)
- Replacement of Diseased cornea by normal cornea
- Donor cornea from Cadaveric Eyes  
    - in 6 hrs death.  
    - may extend to 12 hrs.
- Storage Media



## Types



DSEK - Descemet Stripping endothelial Keratoplasty

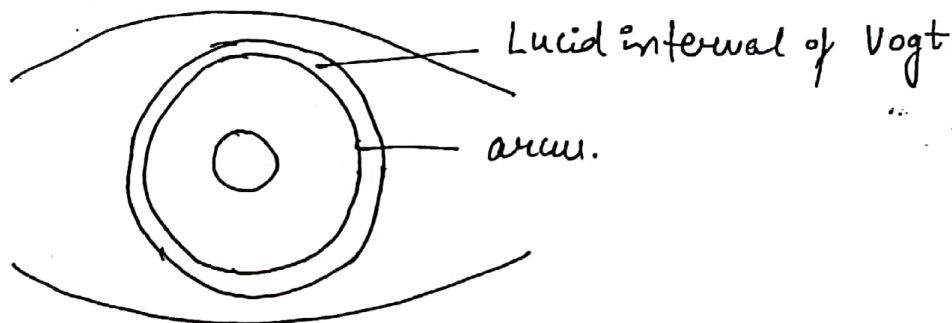
↓  
% of endothelial cell loss - 20-25%

\* Min. endothelial cells in corneal graft  
= 1500 cells /mm<sup>2</sup>

## CORNEAL DEGENERATIONS

Age Related

### ARCUS SENILIS



cause :- Lipid Deposition.

↳ in Stromal Layer

### BAND SHAPED KERATOPATHY

It is deposition of calcium in form of a band.  
Subepithelial Deposition.

#### CAUSE

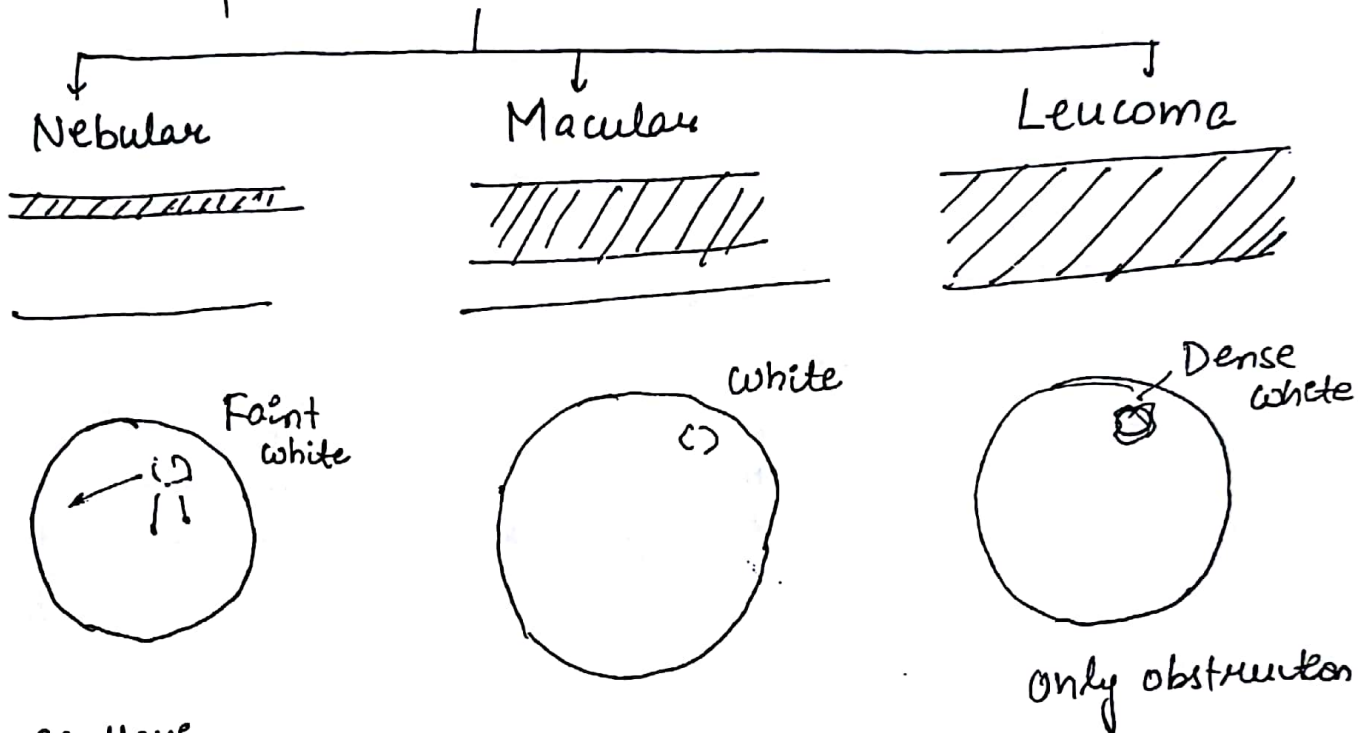
- 1) Idiopathic - H/c
- 2) Chx. Uveitis in children suffering from JRA (Juvenile Rheumatoid arthritis)
- 3) Pthisis Bulbi
- 4) Hypercalcemia → also seen in Sarcoidosis



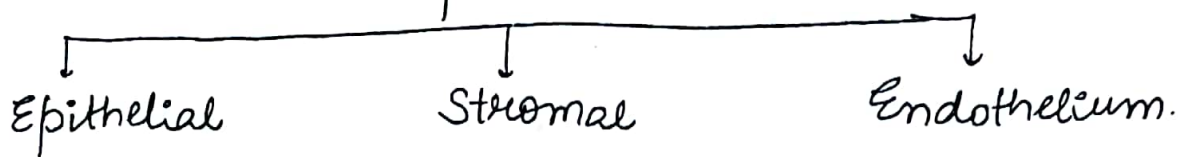
Rx-

1) Chelation  $\bar{c}$  EDTACORNEAL OPACITIES

Scar formed when stroma is involved

Scattering  
Diffractioninterference  $\bar{c}$  func<sup>n</sup>  
of clear cornea.Diminishes vision  
mostPannus = Neovascularisation on cornea.  
from limbal capillaries

# CORNEAL DYSTROPHY



## 1) EPITHELIAL DYSTROPHY -

Pt. presents = recurrent corneal epithelial erosions

Rx - ① Pad/Bandage + antibiotic ointment

② Keratoplasty

### TYPES

Micro-cystic /  
Finger Print /  
Map Dot

↳ M/C type. overall

Meesmans  
Dystrophy

Reis-Buckley

Main pathology  
in Bowman's Membrane

## 2) STROMAL DYSTROPHY -

Present = Diminution of Vision

Rx - Keratoplasty

### TYPES

Macular

↳ overall  
① Least common

② AR inheritance

③ a/w Mucopolysaccharidosis

Granular

Lattice

a/w amyloidosis  
Lattice Type II  
M/C Stromal type

### 3) ENDOTHELIAL DYSTROPHY

c/f - Corneal edema

T/t → ① Hypertonic saline eye drops

② Keratoplasty

Fuch's endothelial  
Dystrophy

Posterior Polymorphous  
dystrophy.

Corneal Guttatae.

Collagenous protuberances  
if present on central  
cornea

Corneal Guttatae  
[+nt in Fuch's endothelial  
Dystrophy]

collagenous Protuberances  
[Hassle-Hanle Bodies]

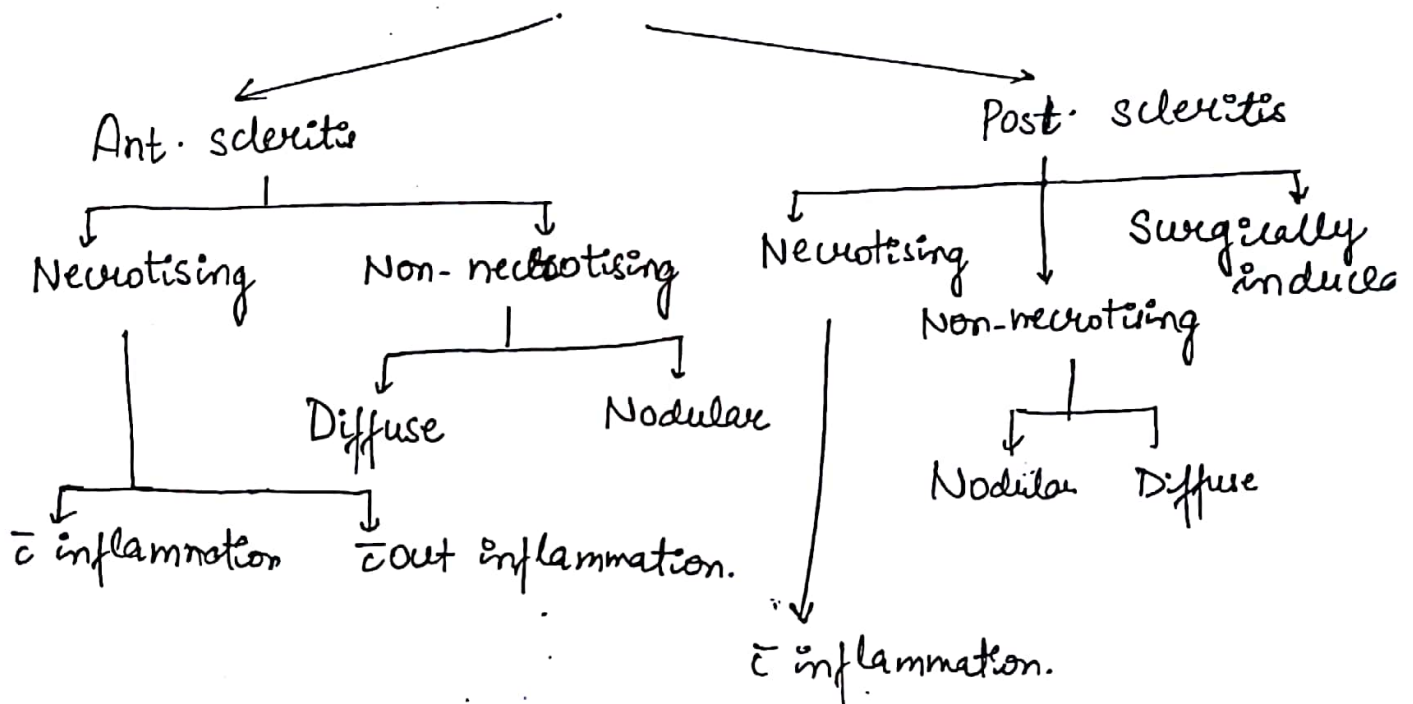
(N)

# SCLERA

86

## SCLERITIS

- 1) Granulomatous Inflammation of Scleral Coat
- 2) Development
  - 1) Neural crest
  - 2) Temporal part - mesoderm
- 3) Thinnest part of sclera  
post to m/s insertion.



They are associated with Connective tissue Disorders

- 1) RA
- 2) Polyarteritis nodosa
- 3) SLE.

Rx - NSAID  
Topical.

② Steroids

### ③ Immunosuppressive Drugs in neurotising sclerosis.

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## SCLEROMALACIA PERFORANS

- Neurotising Ant. Scleritis & ~~out~~ out inflammation
- Seen in pt of R long standing sero +ve RA.

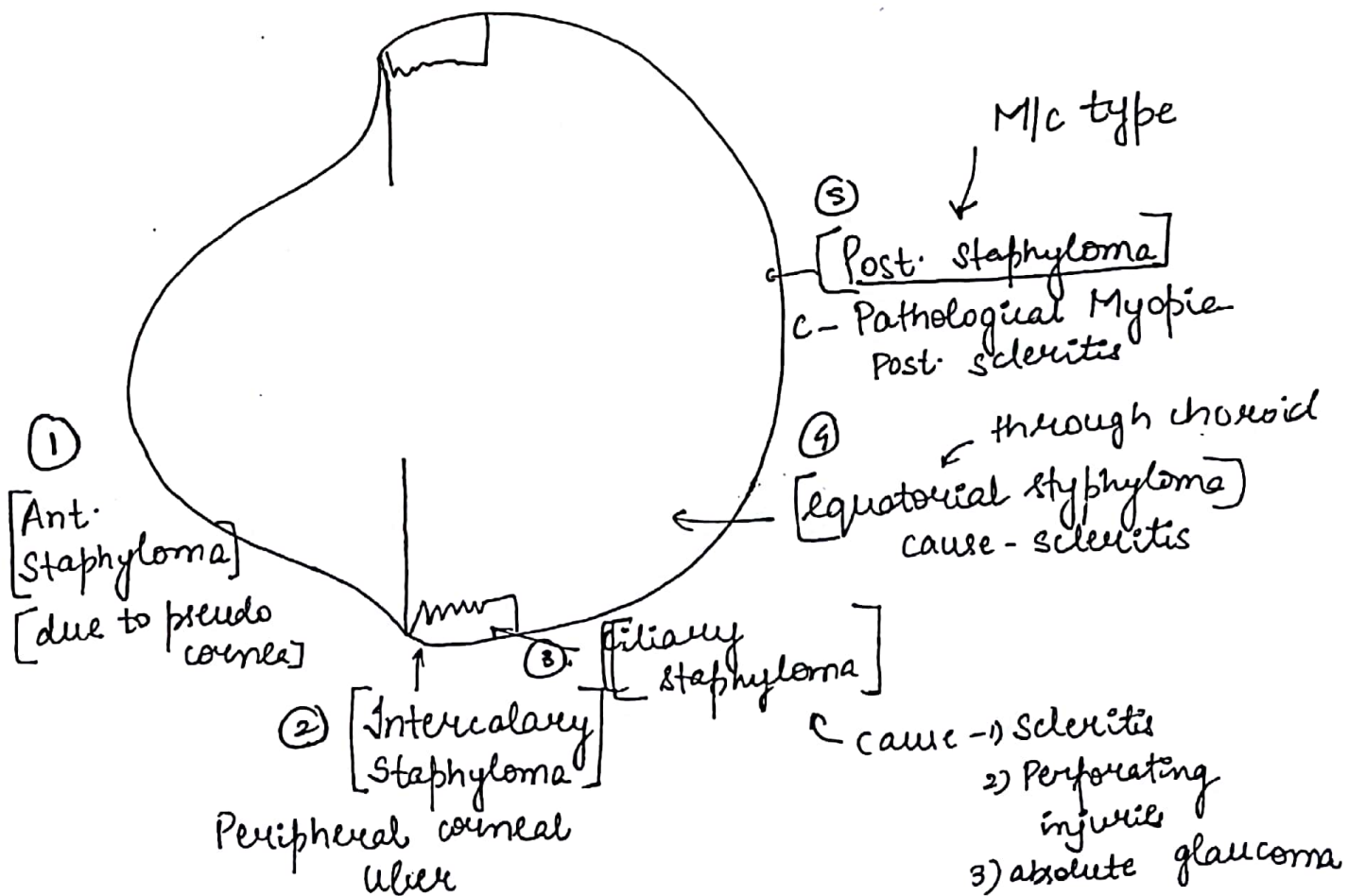
C/F → yellow necrotic patch on sclera  
↓  
later marked thinning of sclera  
↓  
exposed uveal tissue

Perforation is rare.

## STAPHYLOMA

Ectatic cond<sup>n</sup> of eyeball = herniation of uveal tissue.

### TYPES



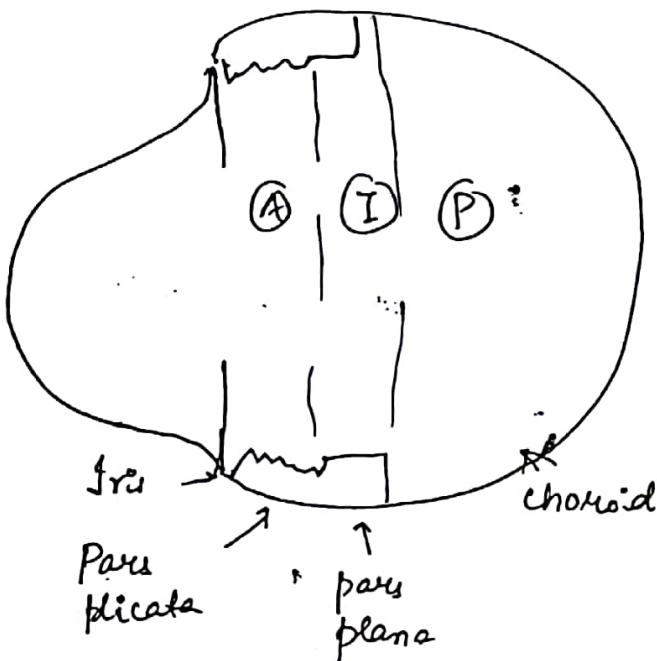
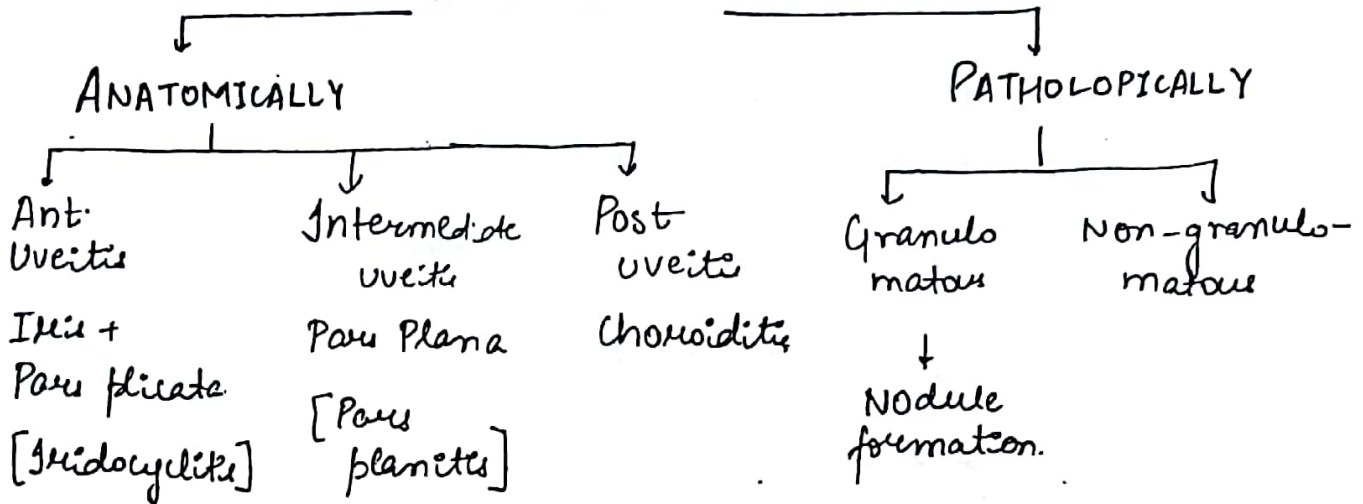


# UVEITIS

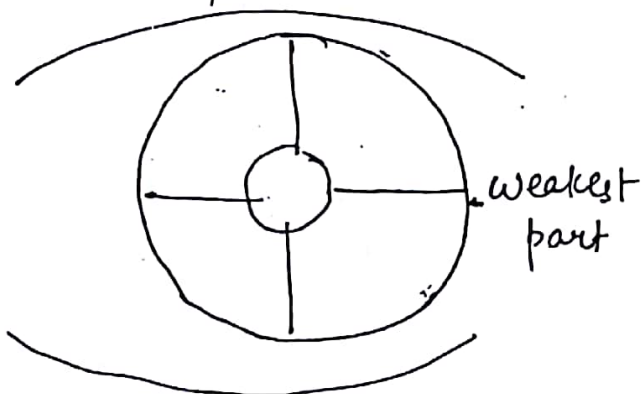
88

Inflammation of uveal tissue

## CLASSIFICATION



weakest part of Iru → ROOT → where it is attached to ciliary body

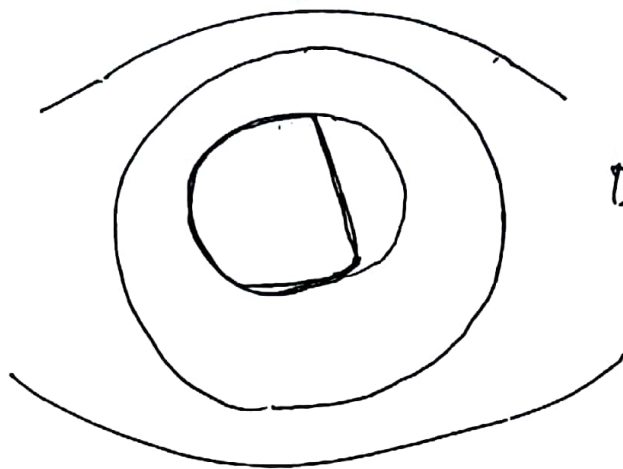


Any disinsertion is called

Iridodialysis

89

D shaped Pupil



D shaped Pupil.

## ANTERIOR UVEITIS

C/F

(5) - Those (5) features.

Redness - ciliary

D/c - Watery/serous

(5) Busacca (at Base)

O/E

(2) Aqueous flare  
(due to protein leakage)

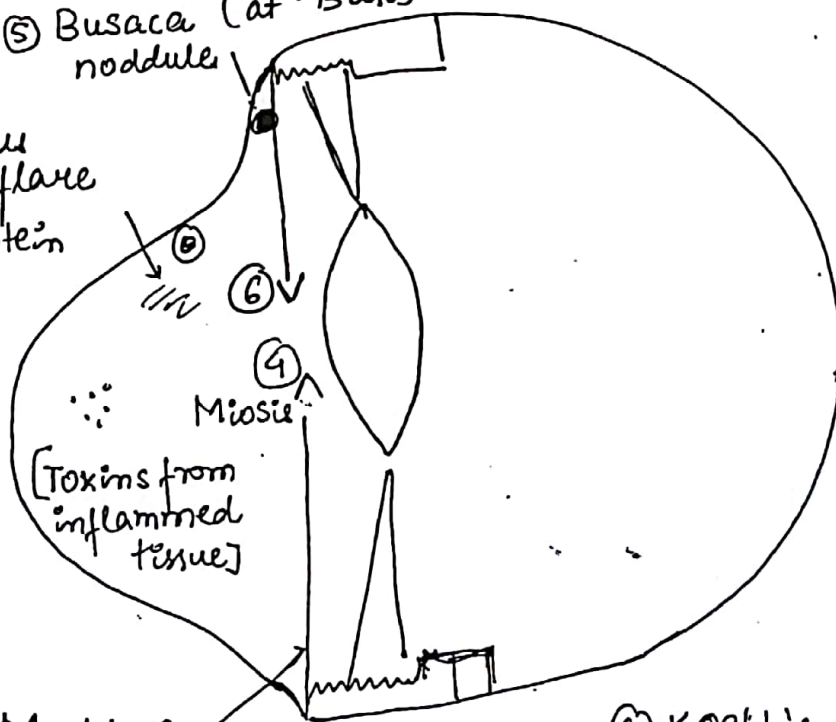
Aqueous  
(1) cells

Miosis

[Toxins from  
inflamed  
tissue]

(2) Muddy Iris  
(oedematous)

(6) Koeppe's nodule  
(at pupillary margin)



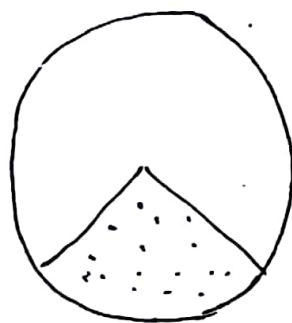
Hallmark feature of Ant. Uveitis  $\Rightarrow$  KP'

90

Non-Granulomatous  
Fine, fleckly

Granulomatous  
Large, Greasy  
[MUTTON FAT]

KP's are seen on lower cornea due to  
convex current in aqueous humour.

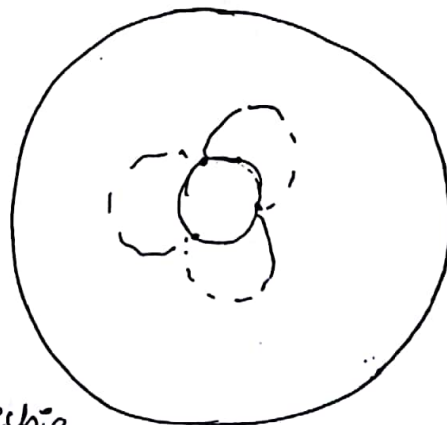


ARLT'S  $\Delta$

### Pathogenesis

Inflammation causes  $\uparrow$  capillary permeability  
 $\downarrow$   
Leads to leakage of cells & protein.

- ⑦ Pestoned shaped pupil.  
post. Synechiae  
on dilatation, this  
appearance

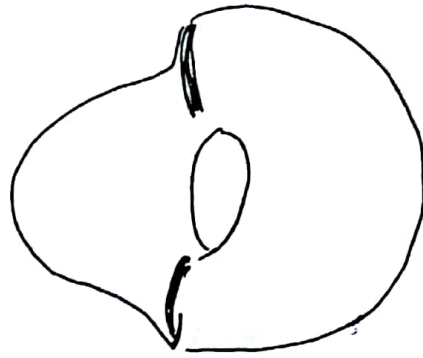


- ⑧ Seclusio Pupillae / Ring Synechia  
Aq. humour starts collecting in Pc.  
Synechia forms.

⑧ Iritis Bombe  
Aqueous humour push  
iris forward

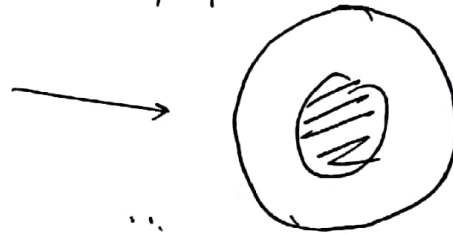
↓  
causes angle block  
later on.

↓  
**ACG.**



Fibrous tissue forms all over pupil  
⑨ ↳ Occlusio Pupillae

Cyclitic Membrane  
Inflammatory membrane  
formed behind Iris



R<sub>x</sub>

1) TOC of Ant. Uveitis → Topical Steroids.

2) Topical Cyclopegics.

- Adv
- a) ~~release~~ relieves spasm gives rest to ciliary m/s  
↑ Better vasculature
  - b) relieves pain
  - c) prevents post synechiae.
  - d) Breaks the post synechiae

LUMINATE Programme -

Study to find non-steroidal t/t of Uveitis.

Drugs being studied - **Voclosporin**

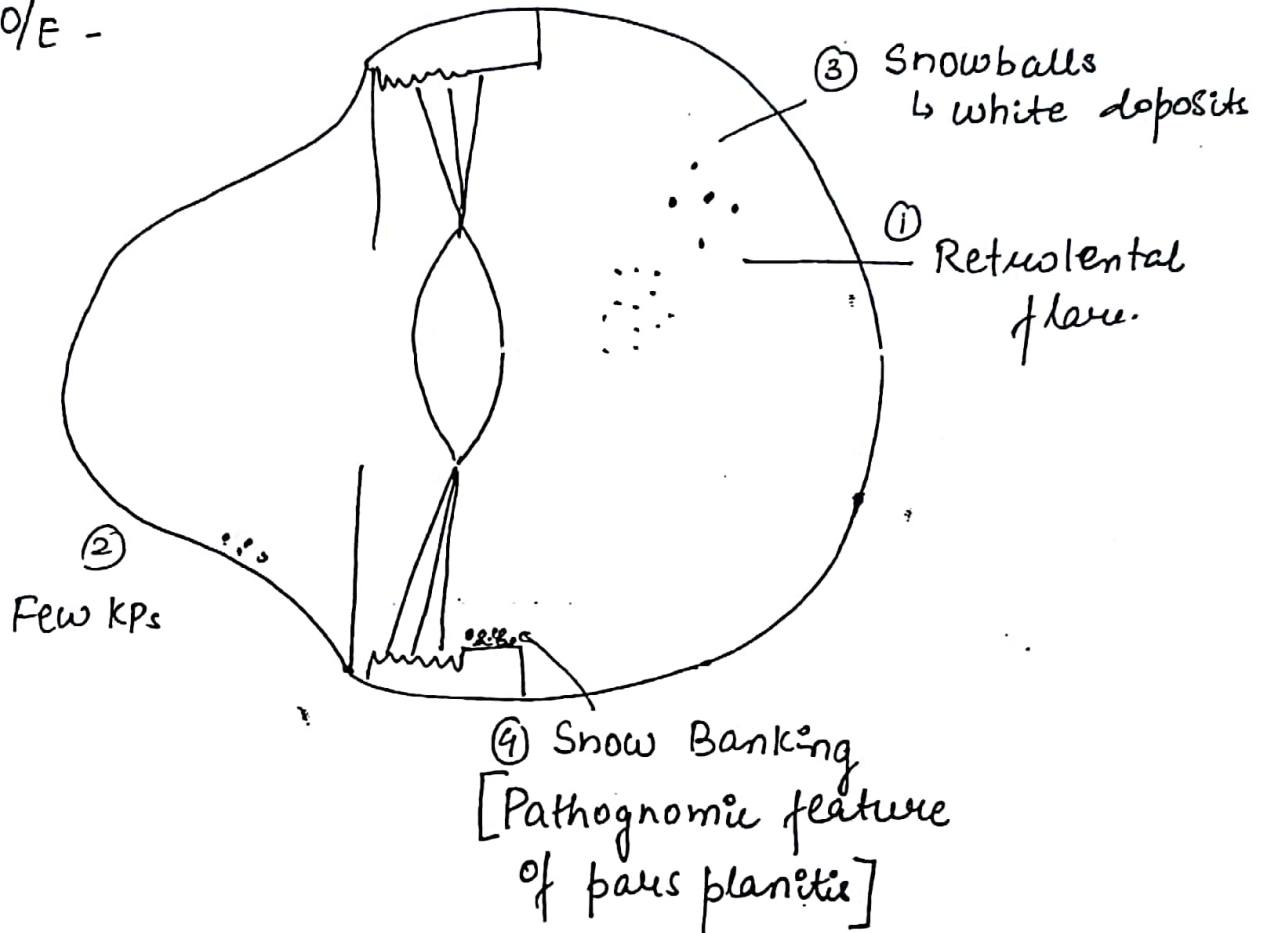
# INTERMEDIATE UVEITIS

92

1) Young ♂

2) C/F - Blurring of vision (U/L)

3) O/E -



Rx

Indications -

1) if vision goes  $\leq 6/6$

2)  $\rightarrow$  it is a/w CME.

✶ I  $\rightarrow$  IV Step Approach

(I) LOCAL STEROIDS

Subtenon injec<sup>n</sup> of Triamcinolone acetate

(II) SYSTEMIC STEROIDS

(III) APPLY CRYO corresponding to snow banking  
damaging blood supply of snow banking



#### ④ PARS PLANA VITRECTOMY

93

clear  
blurring of vision

Bulk of inflammation ↓  
hence pt responds to t/t  
now.

C/E

#### POSTERIOR UVEITIS

① CHOROIDITIS  
round yellow patches [Image]

② VITRITIS

③ Papillitis

④ Retinal edema

⑤ Cystoid Macular edema

⑥ Periphlebitis

Hallmark feature ⇒ venous

sheathing.

Periphlebitis

Rx -

1) Local Steroids

subtenon inj<sup>n</sup> of Triamcinolone Acetate

2) Systemic Steroids

#### DISEASES ASSOCIATED w/ UVEITIS

1) ARTHRITIS

- HLA-B27 associated

- Sero-negative - RF ⊖ve

- Non-Granulomatous Ant. Uveitis

- 1) ankylosing spondylitis
- 2) psoriatic arthritis
- 3) Reiter's syndrome

### TRIAD

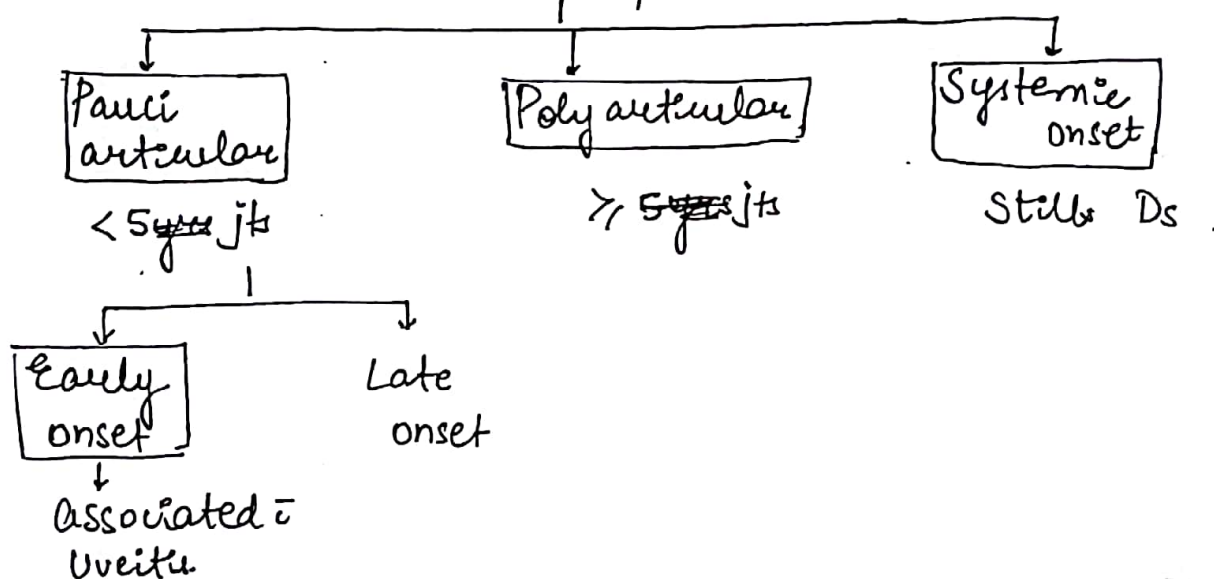
- a) Uveitis
- b) arthritis
- c) conjunctivitis.

4) JRA - early onset pauciarticular sero-neg.

**JRA** -

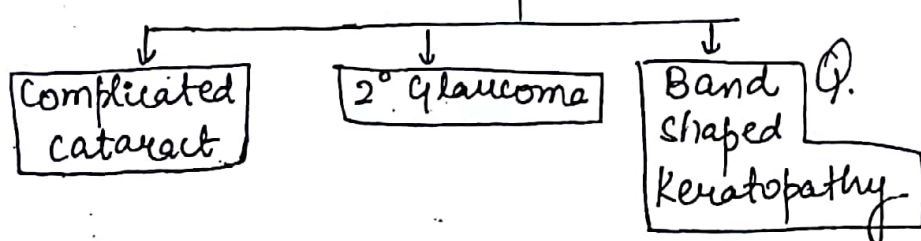
arthritis of <16 yrs

### Classification



Atypical Uveitis → white Uveitis. [in JRA]  
 ↳ ⑤ features  
 ↳ No redness  
 ↳ absent

Child presents with complication:



## 2) SARCOIDOSIS

95

### OCULAR FEATURES

- Sarcoid nodules on episclera & sclera.
- Interstitial keratitis  
Band shaped Keratopathy } cornea
- ~~Granulo~~ Granulomatous Pan Uveitis.
- Venous sheathing of periphlebitis in sarcoidosis.  
is very thick like candle wax  
↳ Candle Wax Dripping Sign [Image] QQ.

Landau's sign:-  
Pre-retinal nodules



- ### 3) BEHCE'T'S Ds / Transient Hypopyon Syndrome
- Obliterating vasculitis due to circulating immune complexes.

HLA B5 ✓  
HLA B51

Pt presents = Recurrent Hypopyon.  
Non-Granulomatous < ant.  
post

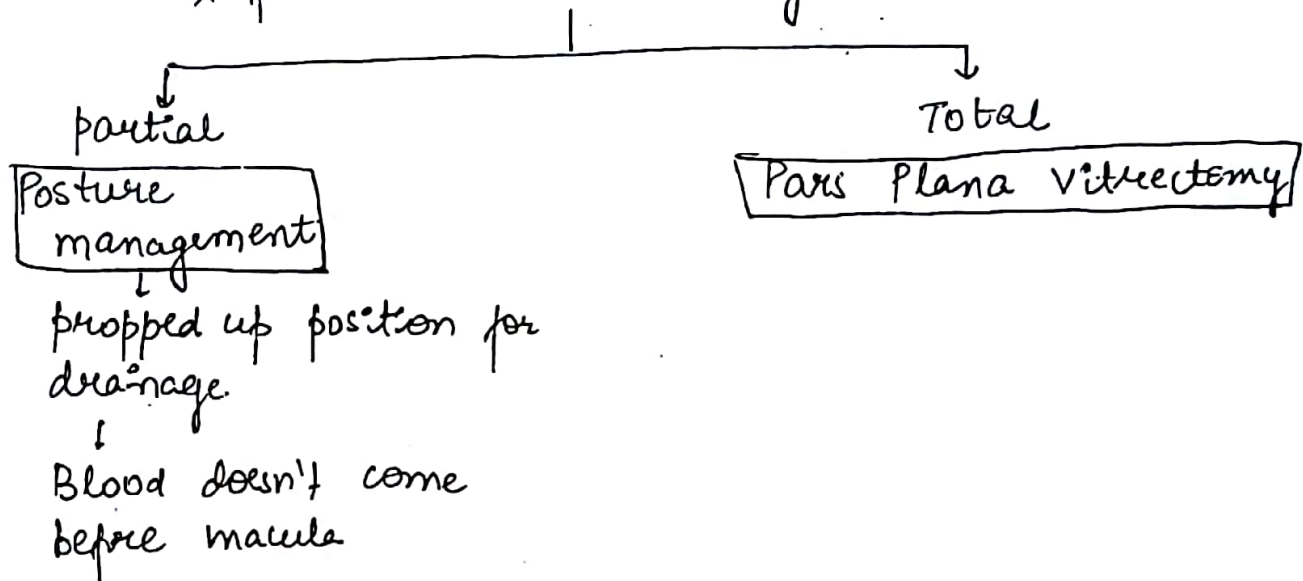
### 4) EALES Ds / PERIPHLEBITIS RETINAE

- Recurrent Vitreous Haemorrhage
- young ♂
- HSN React towards Tubercular Ag. [Type IV HSN]

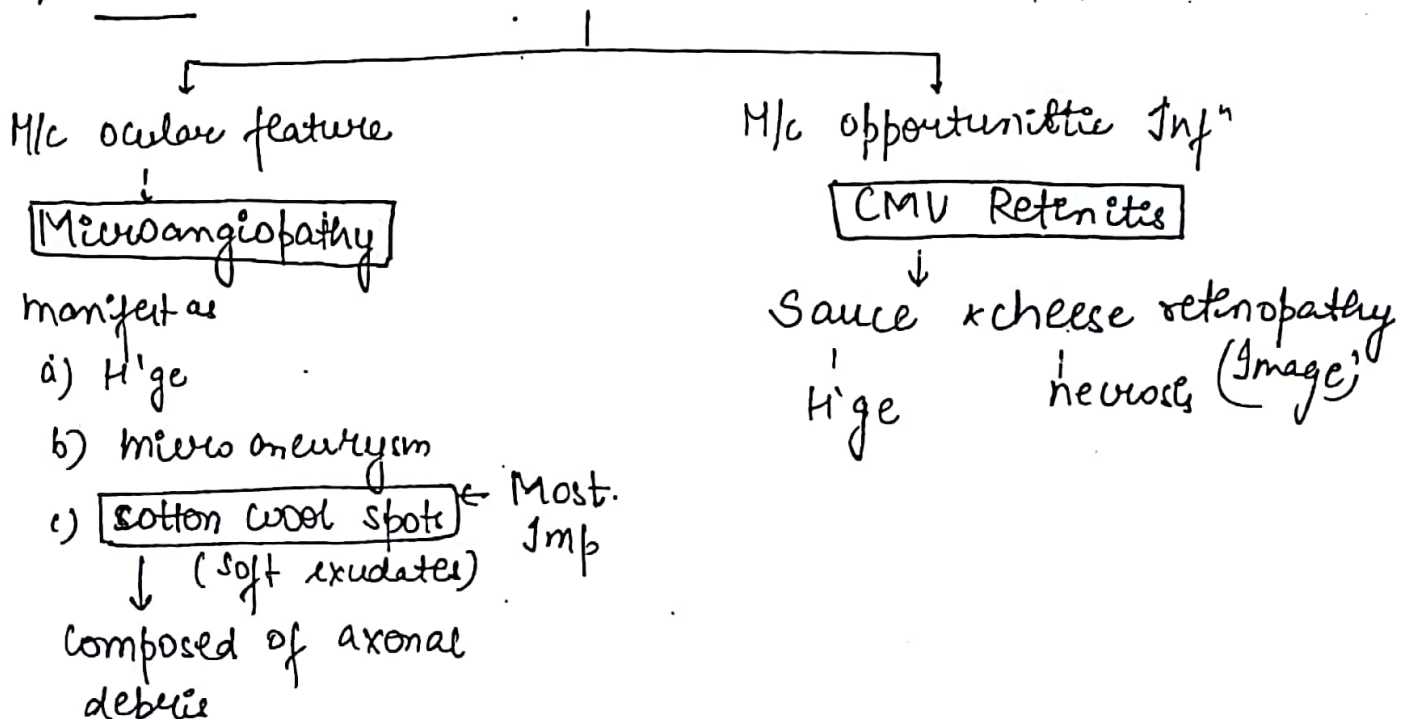
- O/E - 1) Venous sheathing  
2) Vitreous haemorrhage

96

- Rx - 1) Check for active TB  
↓  
start ATT if yes.
- 2) Mx of vitreous haemorrhage



## 57 HIV



**Microaneurysm**  
① Diabetic Retinopathy

**Macroaneurysm**  $> 100\mu$   
HTN Retinopathy

\* Other opportunistic Infect<sup>n</sup> :-

- 1) Toxoplasmosis
- 2) Pneumocystis carinii
- 3) Herpes zoster → ARN [Acute Retinal Neurosis]

cause chorioiditis

Rx -

1) Anti-HIV Drugs.

Pt is on HAART therapy

↳ H/c ocular S/E ⇒ Immune recovery Uveitis

**Non Granulomatous  
Post. Uveitis  
(Vitreitis)**

## 6) TOXOPLASMOSIS

Ant.                      Post

↓  
Intense  
Vitreitis

QQ Head Light  
in fog  
appearance (Toxo) → Tattoo.

Gr.                      Non. Gr.

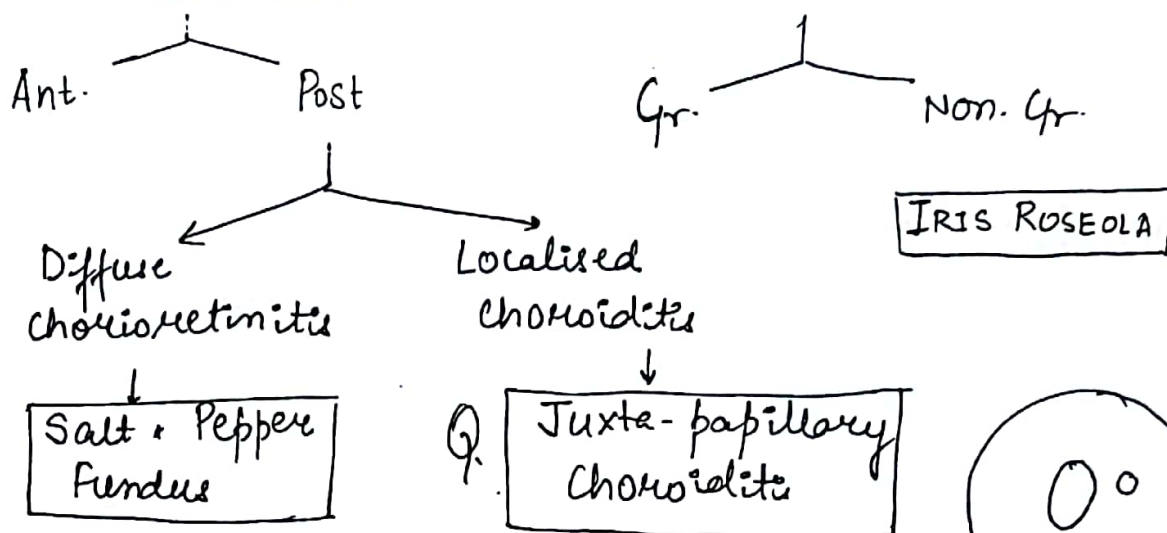
Presents c̄ **Punched out Pigmented Lesion** mainly involving  
Macular area (Image)

Rx → Clindamycin.



## 7> SYPHILIS

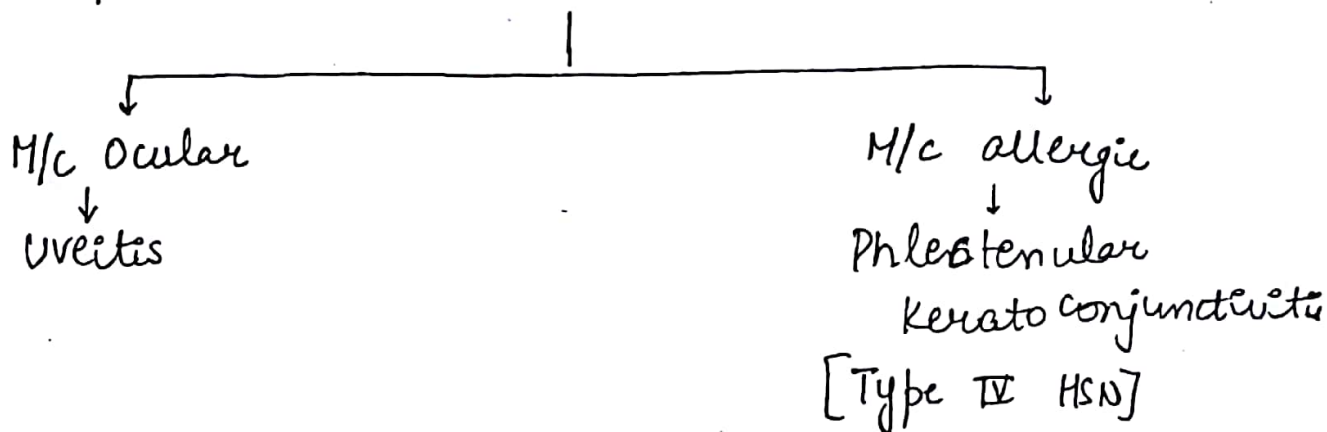
98



R<sub>x</sub> - Penicillin

## 8> TB

Granulomatous Panuveitis



R<sub>x</sub> - ATT.

9> VKH [Vogt Koyanagi Harada Syndrome]

Granulomatous Panuveitis + Systemic Features

HLA-DR4

1) encephalitis

VV TAEP

2) Vestibular Dysfunc<sup>n</sup>

3) Tinnitus

4) Alopecia

(Sugrassyn)

5) Vitiligo

6) Poliosis

Uveitis + encephalitis  $\Rightarrow$  VKH Syndrome.

99

## 107 SYMPATHETIC OPTHALMITIS

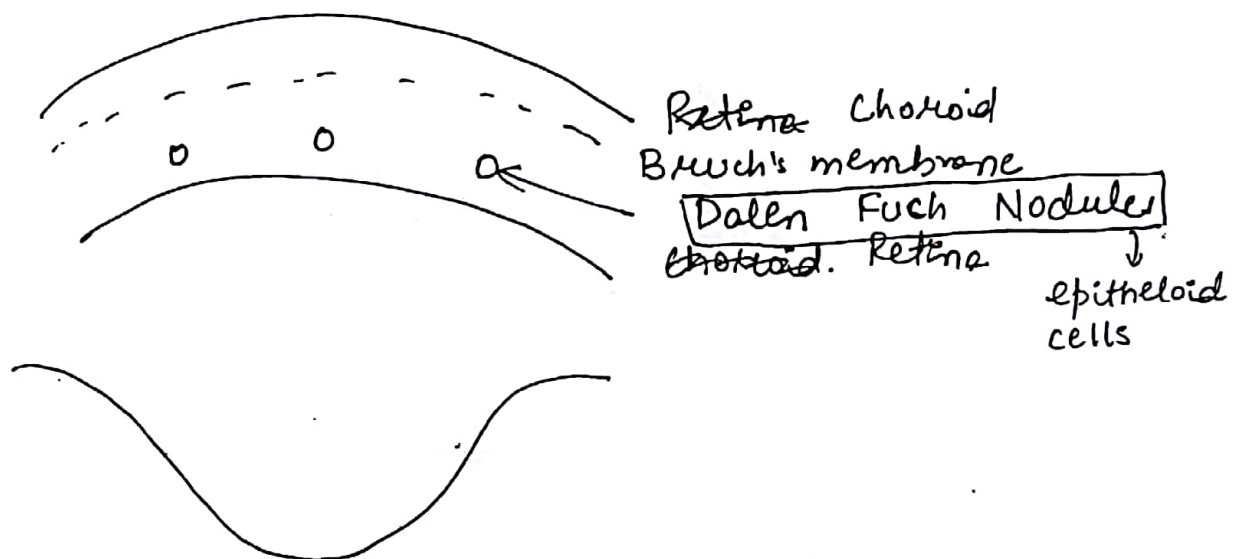
Penetrating injury in 1 eye causing uveitis in the other eye

↓  
causing autoimmune reac<sup>n</sup> in uveal tissue

↓  
Never before 2 weeks.

Max. cases manifest bet<sup>n</sup> 2 weeks to 3 months

Granulomatous Panuveitis



1st sign of  $\rightarrow$  Retrolental flare

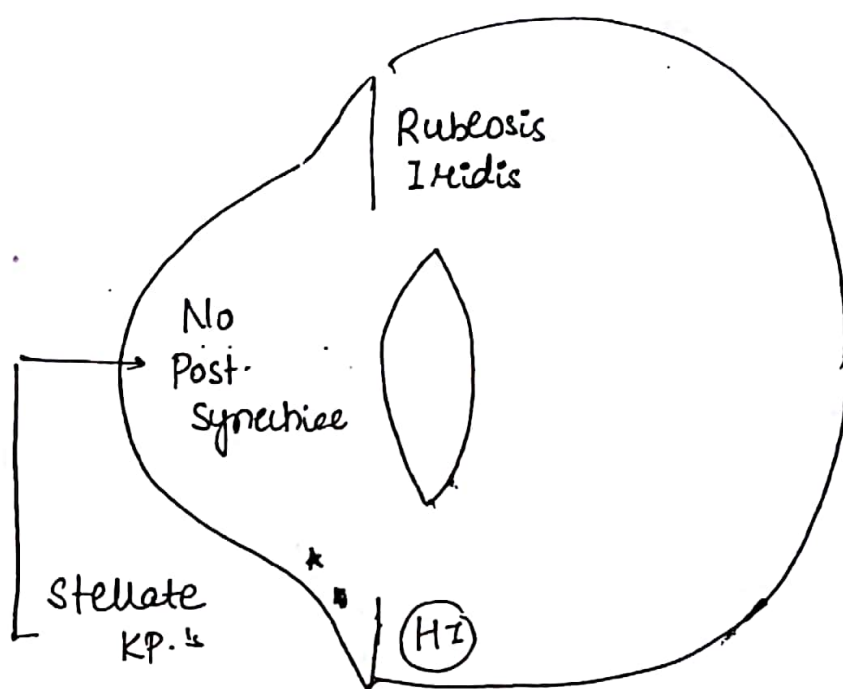
1st symptom  $\rightarrow$  Difficulty in near vision

Dangerous area of Eye :- **CILIARY BODY**

↓  
Becoz. any trauma to ciliary body  
is a big risk of sympathetic ophthalmia

# 117 FUCH'S HETEROCHROMIC CYCLITIS

- Atypical Ant Uveitis
- Non-Gr Ant-Uveitis.
- U/L → characterised by Heterochromia Iridis



No role of Steroids & Cycloplegics.

Pt. presents with [complicated cataract  
2° Glaucoma.

IOL is c/I in JRA.

## 127 ONCHOCERCIASIS

RIVER BLINDNESS

caused by Onchocerca Volvulus

Non-Granulomatous : Ant  
Post

cause of Blindness - Sclerosing Keratitis  
It is included in Vision 2020.

Rx - Ivermectin.

### 13) OPHTHALMIA NODOSUM

- Due to intense Granulomatous inflammation
- Due to Caterpillar Hair in Eye

### VISION 2020

WHO programme to control 5 Disease by 2020.

**INDIA**

- 1) Cataract
- 2) Trachoma
- 3) Onchocerciasis
- 4) Childhood Blindness
- 5) Refractive Errors

No onchocerciasis

3  $\left\{ \begin{array}{l} + \\ \text{DM} \\ \text{Glaucoma} \\ \text{Corneal Blindness} \end{array} \right.$

### LEPROSY:-

ocular involvement more in Lepromatous Leprosy than tuberculoid leprosy.  
Iris Pearls - pathognomonic feature.

Complaints erase good fortune<sub>102</sub>

# CONJUNCTIVA

Thin mucous membrane over the ocular surface

## CONJUNCTIVITIS

Inflammation of conjunctiva

C/F :- (5) features. + F.B. sensation + Discomfort to eye.

Redness - conjunctival

D/c - depends on etiology.

Bacterial  $\Rightarrow$  Purulent

Chlamydial  $\Rightarrow$  Mucopurulent

Viral }  $\Rightarrow$  Watery.  
Allergic }

Pathology

Follicular

Papillary

Formation of Follicles

Epithelial Hyperplasia

aggregation of lymphoid cells

T/t

B } Antibiotic  
C }

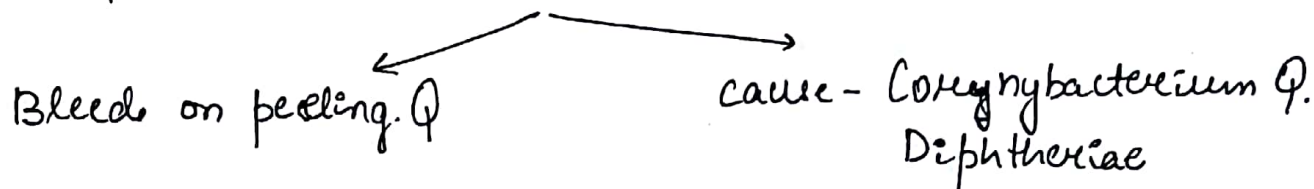
V  $\rightarrow$  Antibiotic to prevent 2<sup>o</sup> infec'

A  $\rightarrow$  antiallergic + steroids (mild)



## MEMBRANOUS CONJUNCTIVITIES

All features + Membrane formation.



## PSEUDOMEMBRANOUS CONJUNCTIVITIES

All features + Membrane formation.

↳ doesn't bleed on peeling

cause → 1) mild diphtheriae.

2) severe adenoviral info<sup>n</sup>

3) streptococcus haemolyticus.

## ANGULAR CONJUNCTIVITIES

Conjunctivitis at 2 canthi + excoriation of skin.

causes - 1) Moraxella Axenfeld. Q

" Lacunata

" Catarrhalis

2) Staph aureus

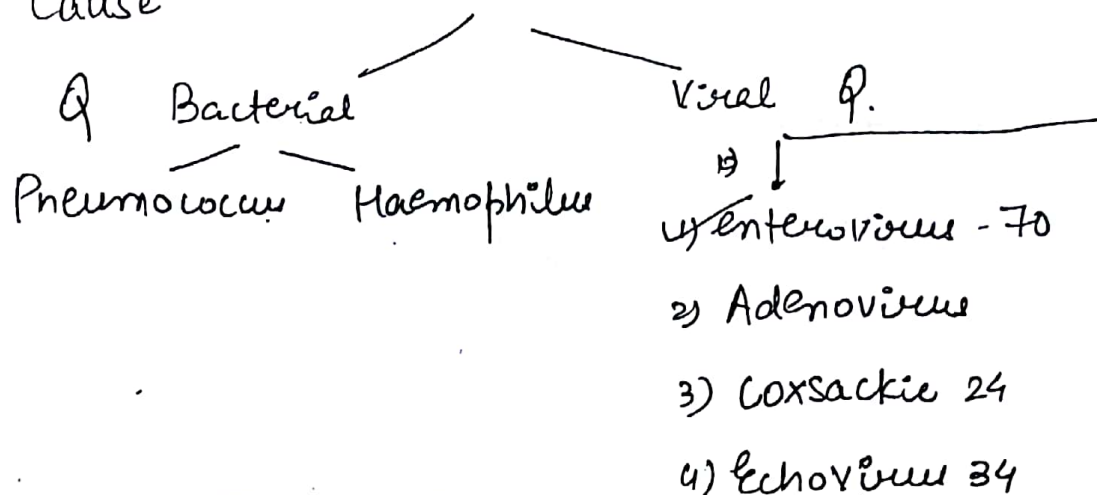
Rx Antibiotic drops

Q ZnO → inhibits proteolytic enzymes

## HAEMORRHAGIC CONJUNCTIVITIES

\$ Conjunctivitis + Subconjunctival haemorrhage

Cause



### CAUSES OF SUBCONJUNCTIVAL HAEMORRHAGE

- 1) Haemorrhagic Conjunctivitis
- 2) Trauma
- 3) HTN
- 3) Bleeding Diathesis
- 4) Whooping Cough.

## TRACHOMA

Chronic conjunctivitis of children

Age - 1-9 yrs

Cause - Chlamydia A, B, Ba, C Q.

Chlamydia D to K ⇒ Adult Inclusion  
Conjunctivitis

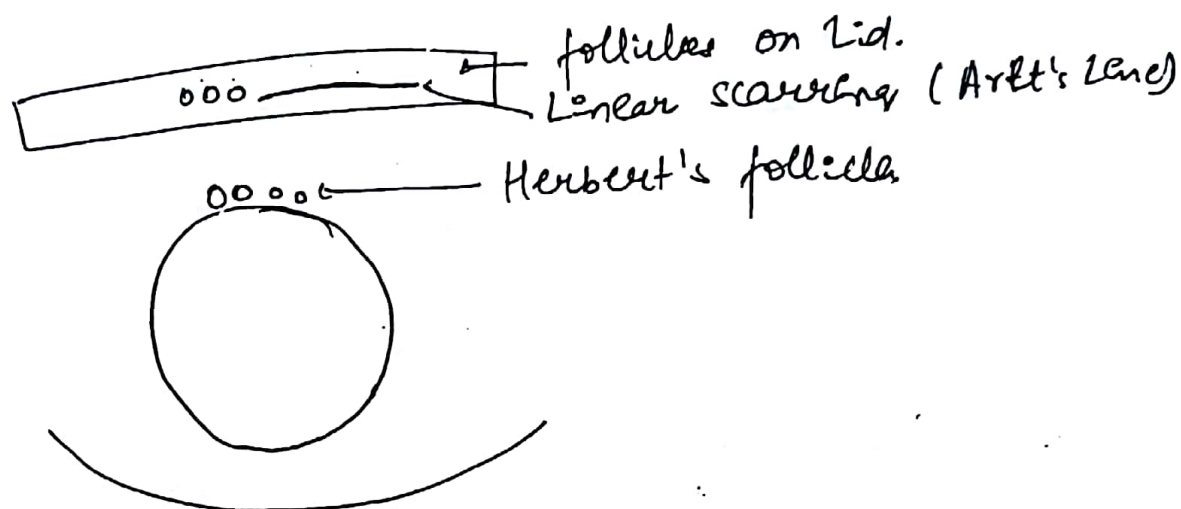
Q Swimming pool conjunctivitis

↳ It is also caused by  
adenovirus.

C/F - { Itching  
watering

O/E - { sagogreen

- 1) Follicles on the upper palpebral conjunctiva.
- 2) follicles on upper limbus  $\Rightarrow$  Herbert's follicles



- 3) Arlt's Line - Linear scarring on Upper palpebral conjunctiva
- 4) Herbert's pits - scarring on Herbert's follicles (upper limbus).

### WHO Classification

F  $\rightarrow$  Follicle

No.  $\geq 5$  follicles

Upper palpebral conjunctiva.

I  $\rightarrow$  Inflammatory stage  
{ Itching  
watering

S  $\rightarrow$  Scarring  
Arlt's Line  
Herbert's pits

T → Trichiasis  
misdirected of eyelash  
O → corneal opacity

Complication of Trachoma ⇒ Corneal Ulcer

Pathology

Both follicular +  
papillary reac<sup>n</sup>

Intracytoplasmic inclusion  
bodies

↓  
HP Bodies

[Halbersterdter Prowaseki].

Community ophthalmology

→ SAFE Strategy

WHO programme to control Trachoma

S - Surgery → only trichiasis Sx

A - Antibiotics →

F - Facial hygiene

E - Environmental cleanliness

Agithro  
mycin

1g in  
adults.

20mg/kg Children.

Topical  
Tetracycline

1% ointment

Atropine ointment is  
also 1%

Prevalence of Trachoma follicles in  
Age group 1-9 yr

if >1% ⇒ follow SAFE Strategy  
5-10% ⇒ F & E.

< 5% - Nothing is done.

107

→ Vision 2020 programme

DOC for Blanket therapy  $\Rightarrow$  AZITHROMYCIN.

↳ for prevention

Rx - DOC  $\rightarrow$  AZITHROMYCIN QQ

Other options - 1) Tetracyclin

2) Sulphacetamide eyedrops

## ALLERGIC CONJUNCTIVITIS

### PHLYCTENULAR KERATO CONJUNCTIVITIS

Endogenous antigen.

1) Staph aureus

2) TB

C/F

Itching  
Watering

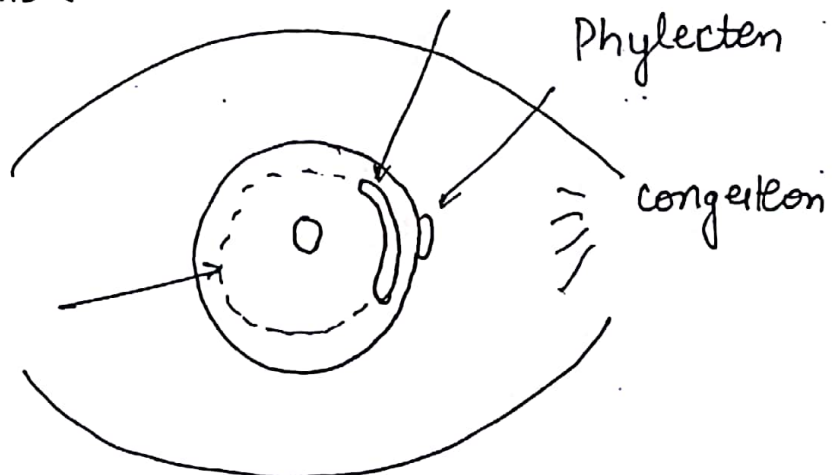
O/E

Phlycten at Limbus

Fascicular ulcer  
Later  
forms  $\rightarrow$  Ring  
ulcer

(When cornea is involved)

Fascicular Ulcer.



Type IV HSN (R)



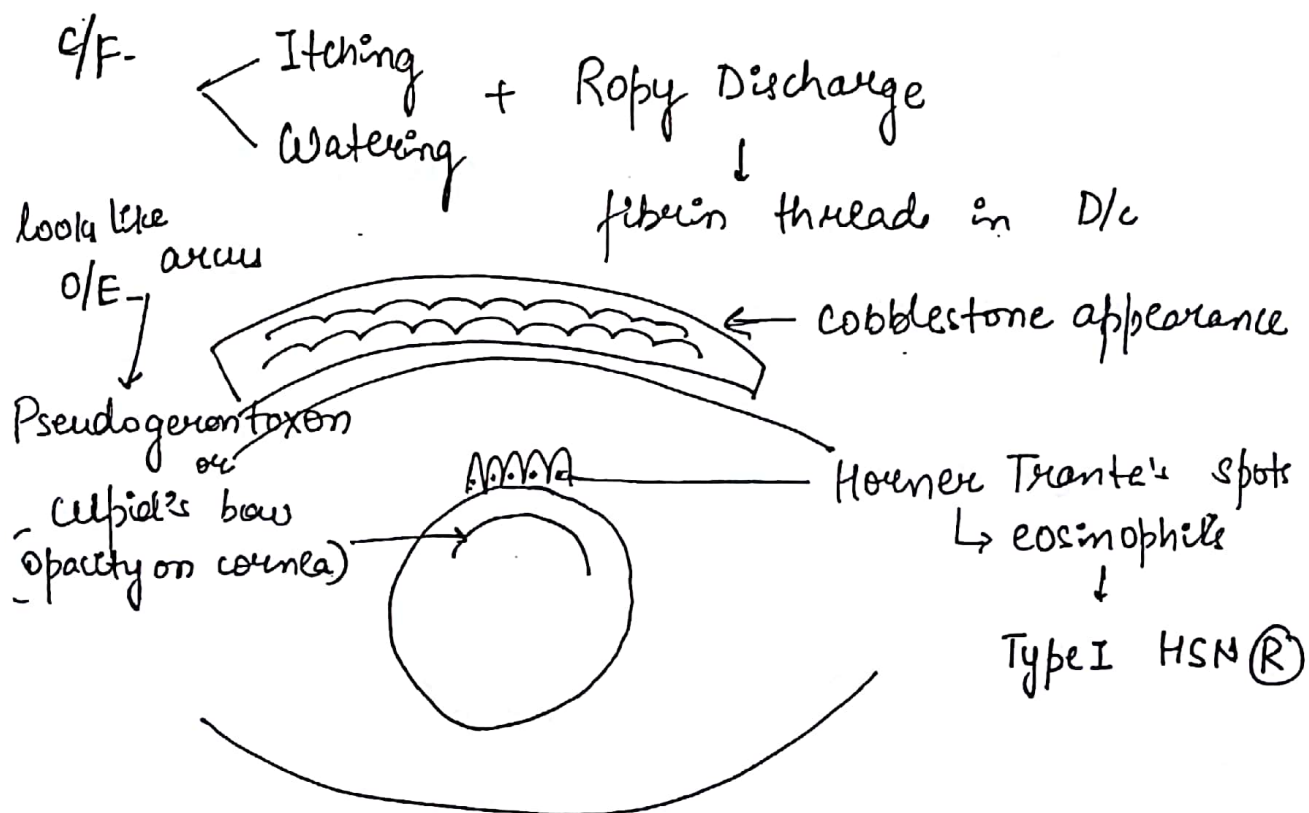
Rx ① OLOPATADINE } → Mast cell stabilizer  
 ② EPINASTIN } Antihistamine

108

③ Na Cromoglycate - mast cell stabilizer  
 ④ Steroids - fluoromethalone

## VERNAL KERATOCONJUNCTIVITIS or SPRING CATARRH

- 1) Disease of Summer
- 2) - Age group - ♂ children
- 3) Exogenous Antigen. 
 Dust  
 Pollen
- 4) No follicular Reac<sup>n</sup>.



Maxwell-Lyon sign  
the eosinophile in Ropy D/c

R<sub>x</sub> - same as phlyctenular



# OPHTHALMIA NEONATORUM

## NEONATAL CONJUNCTIVITIES

111

Defined as conjunctivitis in 1 month of age

Cause -

- 1) Chlamydia → H/c cause → 4-10 days
- 2) Gonorrhoea → 2-4 days
- 3) chemical conjunctivitis
- 4) Herpes simplex virus.
- 5) Staph aureus

CREDES METHOD:-

1%  $\text{AgNO}_3$  in (B) eyes to prevent Gonorrhoeal

Conjunctivitis

Not followed now as it causes chemical conjunctivitis

## VITAMIN - A DEFICIENCY

### XEROPHTHALMIA

Conjunctival xerosis.

#### TYPES

↓  
EPITHELIAL  
XEROSES

xerophthalmia.

↓  
PARENCHYMATOUS  
XEROSES

all cause of Scarring.  
conjunctival.

→ Trachoma

→ all types of burn  
(chemical, thermal, electrical,  
radiational)

→ Steven Johnson Syndrome

Alkali is more dangerous as it can penetrate eye

## XEROPHTHALMIA

### \* WHO GRADING

$X_N \rightarrow$  Nyctalopia / Night Blindness

$X I_A \rightarrow$  Conjunctival xerosis

$I_B \rightarrow$  Bitot's spots

$X II \rightarrow$  Corneal xerosis

$X III_A \rightarrow$  Keratomalacia  $< \frac{1}{3}$ rd of cornea

$B \rightarrow$  "  $> \frac{1}{3}$ rd

$X_S \rightarrow$  Corneal scarring

$X_F \rightarrow$  xerophthalmic Fundus  
(white spotted Fundus)

Q. earliest feature of vit A Def<sup>n</sup> - Nyctalopia

Q. Bitot's spot more common  $\subseteq$  side  $\rightarrow$  temporally

\* 2° signs -

$X_N \checkmark$  (rest are 1° signs)

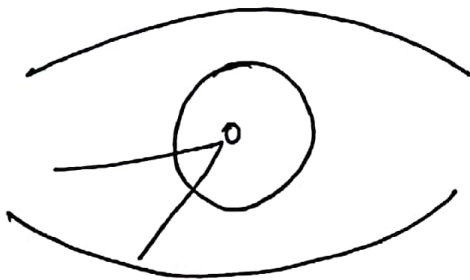
$X_S \checkmark$

$X_F \checkmark$



R<sub>x</sub> >1yr = Inj<sup>n</sup> vit A 1 lakh IU 0, 1, 14 days.  
 <1yr = Half the dose

### PTERYGIUM



Subconjunctival fibrovascular tissue encroaching the cornea.

Q. Not inflammatory. It is connective tissue disorder.

Q. M/c side → Nasal.

### ETIOLOGY

Due to exposure to UVB rays

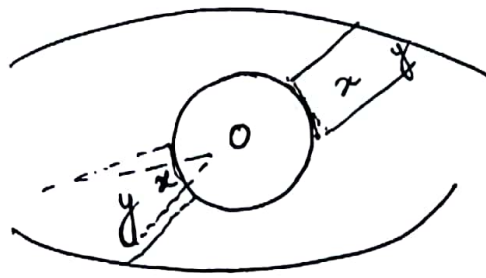
C/F-

- 1) Cosmetic
- 2) Astigmatism → curvature is affected
- 3) If encroaches pupil → leads to diminution of vision.

R<sub>x</sub>

→ Excision

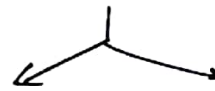
Recurrence is main challenge



Bare sclera Technique  $\rightarrow$  High Rate of Recurrence



Prevent Recurrence



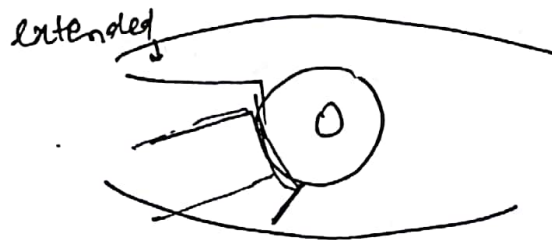
Mitomycin-C

Autografting  
(Best method)

PERFECT Surgery :-

[Pterygium extended Resection Followed by Extended Conjunctival Transplantation].

Recurrence = 0.



Pterygium

Not passed

GLASS ROD TEST

Pseudopterygium

Glass rod passes easily

# DRY EYE

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## LAYERS OF TEAR

- 1) Lipid Layer ——— By meibomian Glands → helps to prevent evaporation of tear.
- 2) Aqueous ——— secreted by Lacrimal & Acc. Lacrimal helps in lubrication
- 3) Mucin (Innermost) ——— from Goblet cells G.  
↓  
helps to spread tear on ocular surface  
Max. Goblet cells  
↳ Inferonasal conjunctiva

Deficiency of any of the 3 layers = Dry Eye

## \* KERTOCONJUNCTIVITIES SICCA (KCS)

Deficiency of AQUEOUS Layer.

KCS + xerostomia = 1°



1° Sjogren's Syndrome

+

Connective tissue Disorder



2° Sjogren's Syndrome

C/F -

- 1) Burning Sensation
- 2) Gritty sensation
- 3) Severe ——— Pre-corneal Tear film → D/V



Inv.

116

1) SCHIRMER'S TEST :-

Tear strip is put under lower lid for 5 mins

Any wetting of  $< 5 \text{ mm}$  = severe dry eye

2) TEAR FILM BREAK UP TIME :- (BUT)

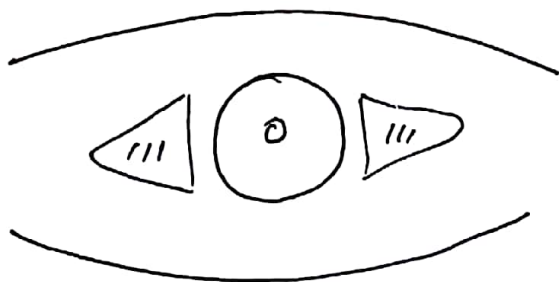
From Last Blink, how much time is taken for 1st dry spot to appear



If  $< 10 \text{ sec}$  → Dry eye

3) ROSE BENGA STAIN :-

Stains dead cells, mucus



4) TEAR OSMOLALITY -

↑ used in patients of Dry eye

AIMS DO

PHENOL RED DYE Test :- measures the production of tears without topical anaesthesia, as the dye changes its colour to red on contact with tears. It doesn't require pH meter for reading the result

$R_x$ 

MEDICAL



Lubricatory Eye Drop



Methyl cellulose  
derivatives

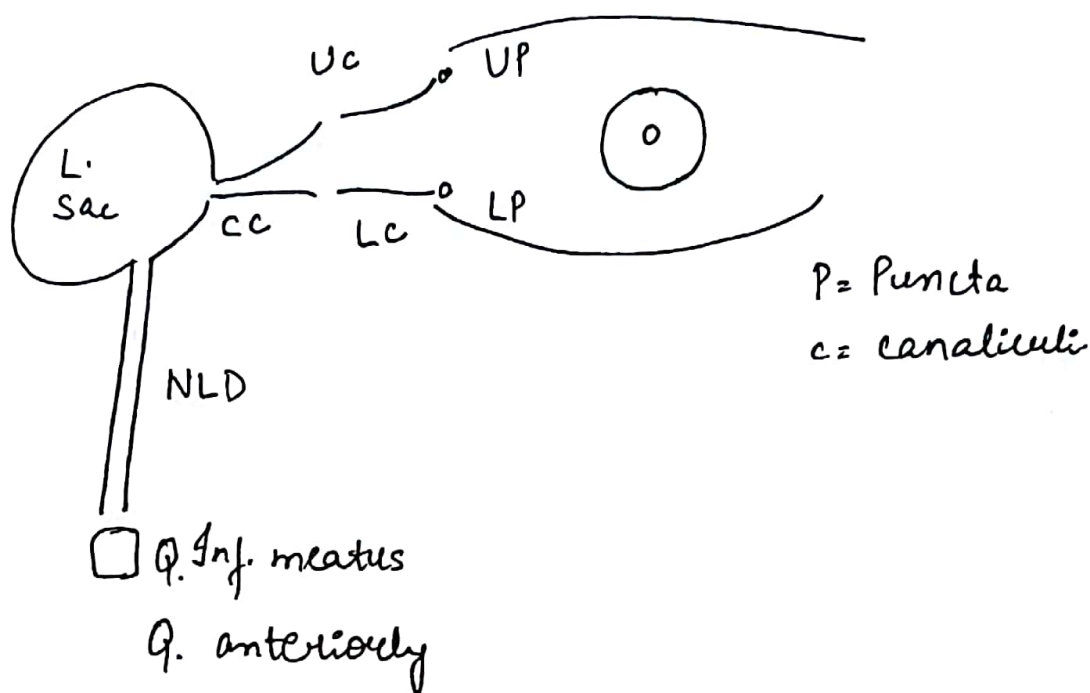
SURGICAL

Lacrimal punctal  
occlusion.

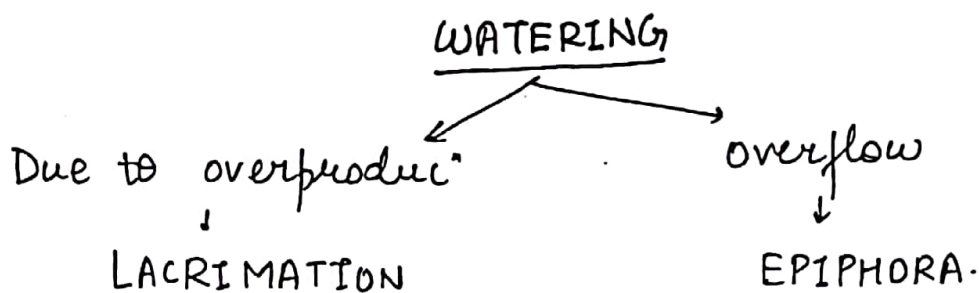


# LACRIMAL DRAINAGE SYSTEM

118



Q. On closing eyes → arrangement of puncta  
 ↓  
 UP is medial to LP.



\* Whenever drainage system blocked → epiphora Discharge.

Inv -

1) Regurgitation Test -

pressing on medial canthus, when water + pus regurgitate, test is +ve.

## 2) Syringing -

- If regurgitation is from opposite puncta
  - ↳ indicate blockage in common canaliculi & forward
- If regurgitation is from same puncta
  - ↳ puncta itself is blocked
- partial obstruction can be opened by syringing

## 3) Dacryocystography

Inject dye in tear

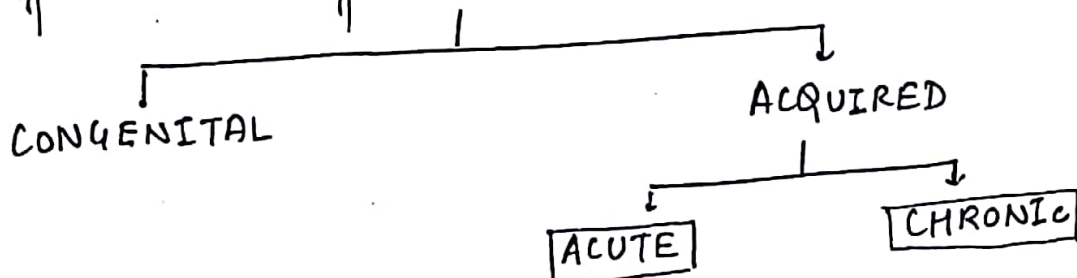
↓  
Radiography

## 4) Dacryoscintillography -

Radioactive dye is used.

## DACRYOCYSTITIS

Inflammation of lacrimal sac.



## CONGENITAL DACRYOCYSTITIS

120

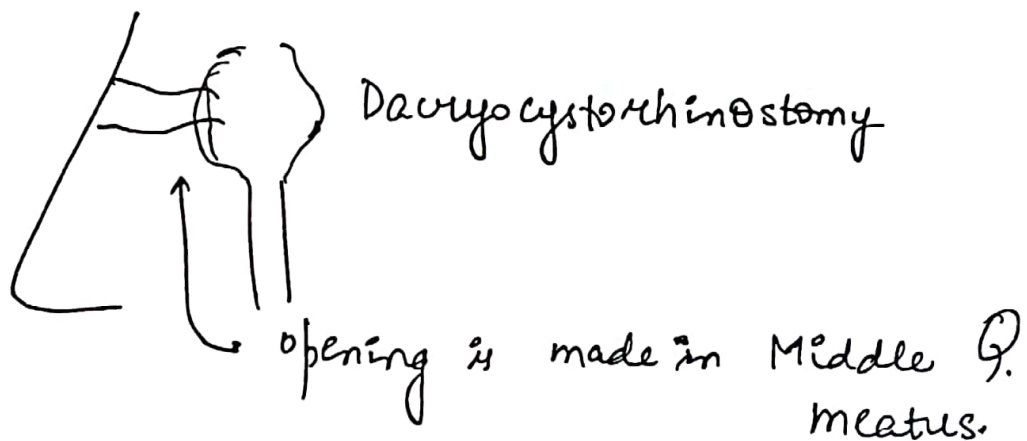
ETI-due to non-canalisation of NLD.

C/F - epiphora  
Discharge

Rx - < 6 months → Massaging & antibiotic eye drops  
(CRIEGLER'S MASSAGE)

6-18 months → Best result is by Probing.

>18 months → Best result is by DCR



Q. DCR → from 4yr onwards. → 70yr

>70yr - atrophy of nasal mucosa

Q. When does tear Production starts?

6 weeks. → (Reflex tear production.)

# ACQUIRED DACRYOCYSTITIS

121

## ACUTE

C/F. → Epiphora  
→ Discharge  
→ Acute Inflammation

Rx - Control Inflammation = antibiotics / anti-~~ather~~ inflammatory.  
↓  
DCR

Q. Sequelae → Lacrimal fistula  
↓  
Rx = DCR.

Q M/c. Etiological agent → Staph. aureus.

## CHRONIC

Q ♀ > ♂

Q. M/c etiological agent - Staph. aureus > strepto. pneumoniae

C/F - epiphora  
D/S

Rx - DCR.

Sequelae → Mucocele formation.  
↓ infected  
Pyocele formation  
↓  
Lacrimal fibrosis

Rx of Lateral fibrosis → Davyocystectomy

Q. M/c ocular feature of MUMPS?  
→ Davyocystadenitis.

Q. M/c ocular feature of MEASLES?  
→ Vit. A Deficiency.

Q. SNOW BLINDNESS/ PHOTOPHTHALMIA ?  
→ Injury by UV B rays.

→ Reflection from snow

C/F - corneal epithelial erosion

Rx - Pad, Bandage & antibiotic ointment

Q. PHOTO - RETINITIS ?

→ Injury by Infra-red rays

→ Directly looking at solar eclipse & unaided eye

→ C/F - Macular Burn.

↓  
Macular scar.

No effective Rx.



## CAUSES OF NYCTALOPIA

123

- 1> Vit A Deficiency
- 2> Retinitis Pigmentosa
- 3> High Myopia ( $>6D$ )
- 4> Late stage of POAG.

### 5) Oguchi's Disease

↳ congenital stationary Nt. Blindness  
Pale fundus

• Mizou's phenomenon

↳ Sitting 1 hour in dark  
No Night Blindness

Fundus is (N)

Occurs due to overstimulation of rods

6) Choroideremia } choroidal dystrophy

7) Gyrate atrophy }

↳ due to Def<sup>n</sup> of Ornithine aminotransferase  
or transcarbamoylase

Fundus Exam<sup>n</sup> →



atrophic patches on  
choroid

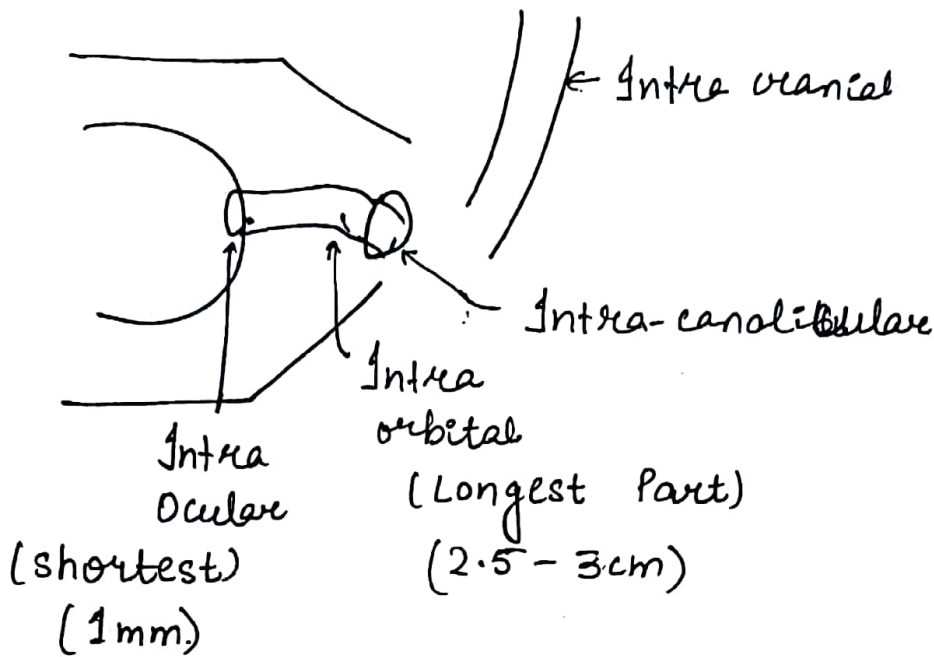
R<sub>x</sub> → Arginine free diet

## CAUSES OF HAMARLOPIA (Day Blindness)

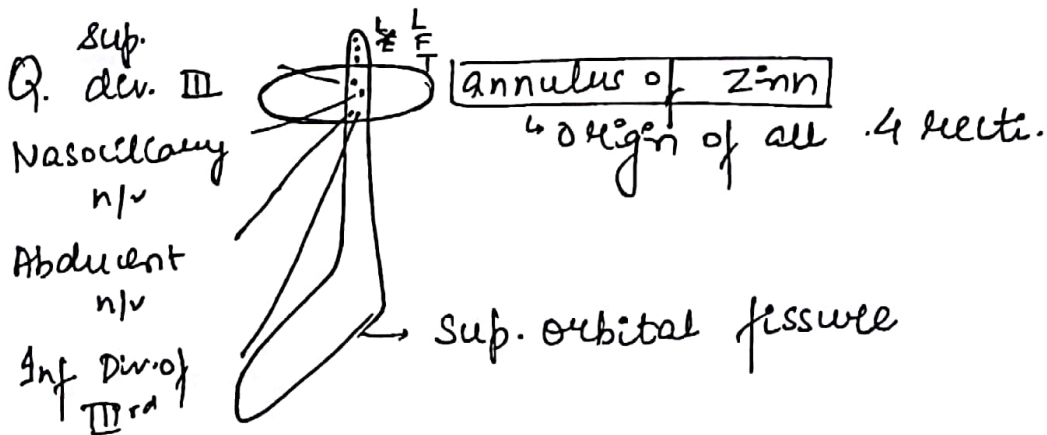
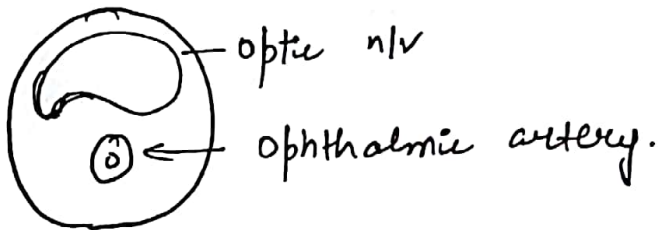
- 1> Central corneal opacity
- 2> " lenticular "
- 3> ~~Congen~~ Congenital absence of cones
- 4>

# NEURO-OPHTHALMOLOGY

125



Q. structures passing through optic canal



N/vs → L Lacrimal  
F Frontal  
T Trochlear

LR 6 SO 4  
 SR  $\rightarrow$  by sup. div. of  $\text{III}^{\text{rd}}$  n/v  $\nearrow$  LPS m/s  
 MR }  
 IR }  $\rightarrow$  by Inf. div. of  $\text{III}^{\text{rd}}$  n/v  
 IO }

## OPTIC NEURITIS

[Optic n/v Disease]

Def<sup>n</sup>- Pathological cond<sup>n</sup> of ~~opt~~ optic n/v where n/v impulse transmission is hampered

C/F:-

- 1)  $\downarrow$  visual acuity
- 2) Visual field Defect  
 $\hookrightarrow$  Central Scotoma
- 3) Afferent Pupillary Defect - 1st Sign  
 (something away from  $\odot$  pupillary reflex)
- 4)  $\downarrow$  color Brightness.
- 5)  $\downarrow$  Brightness

# CLASSIFICATION

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ANATOMICALLY

ETIOLOGICAL

- 1) Inflammatory
- 2) Degenerative
- 3) Autoimmune
- 4) Hereditary
- 5) Ischaemic

PAPILLITIS



Blurred disc margin

RETRO-BULBAR NEURITIS



Fundus - (N)

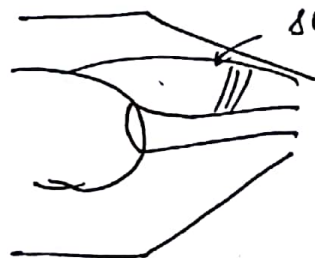
Pathognomic feature

RAPD

Diagnosed by swinging flash light test

Marcus-Gunn Pupil

Pain on elevation.



sup. rectus has connect<sup>n</sup> myelin sheath of optic n/v

on elevation → m/s stretched

cause pain.

Q2 ATIMS

Most likely Δ in the pt who presents w/ painful v/l dimness of vision & h/o of persistence of after image = Retrobulbar neuritis



## ETIOLOGICAL

### 1) INFLAMMATORY -

All causes of post uveitis.

### 2) DEGENERATIVE -

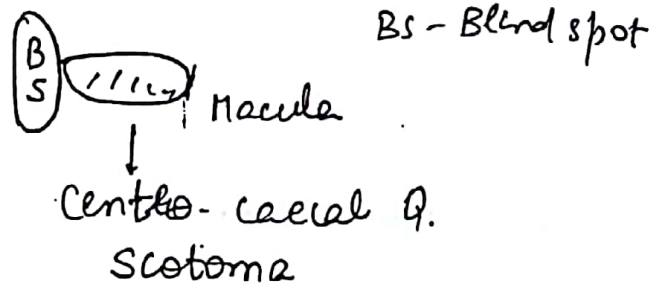
Multiple sclerosis

Toxic amblyopia Q

cause

- 1) Tobacco
- 2) Ethambutol
- 3) Chloroquine
- 4) Ethyl alcohol
- 5) Methyl alcohol

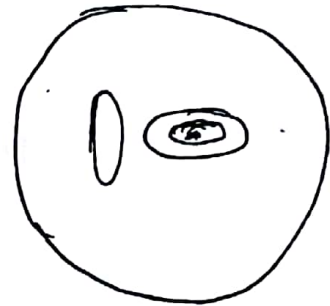
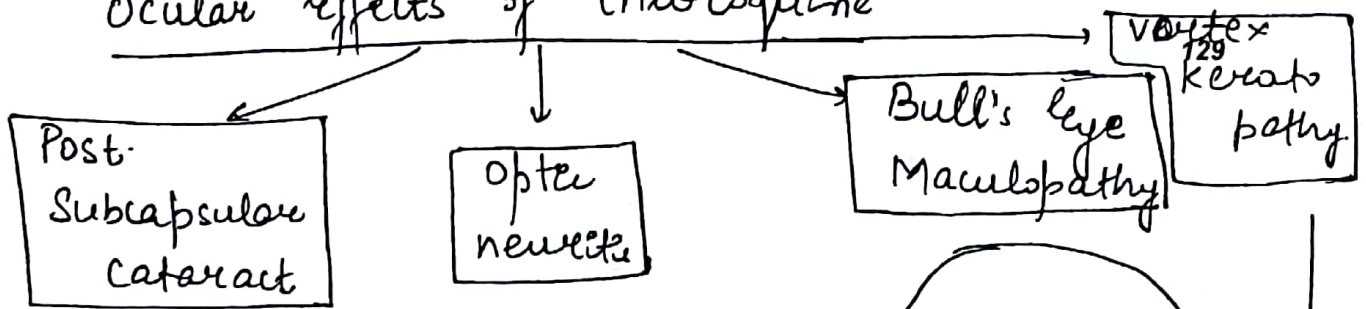
### TOBACCO



### METHYL ALCOHOL

Directly damages ganglion cell.  
hence more dangerous.

## Ocular effects of chloroquine



whorl-like/  
v-shaped

Cornea } other name  
Verticillata

### \* Other causes of Vortex Keratopathy -

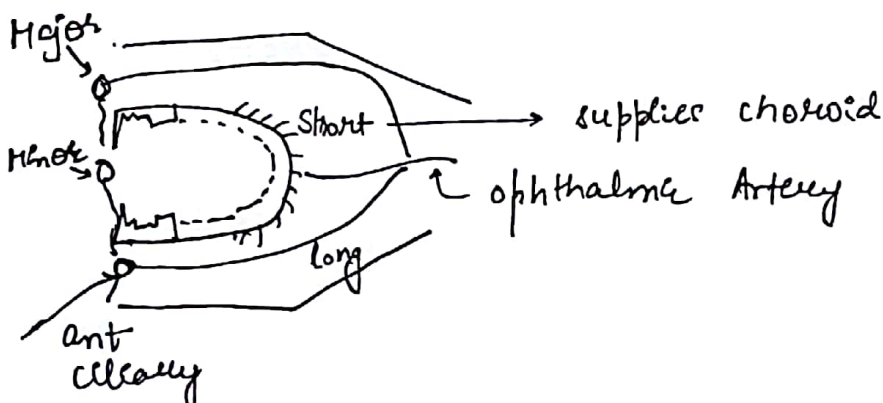
- 1) chloroquine
- 2) Amiodarone
- 3) Tamoxifen
- 4) Indomethacin
- 5) Feby's Disease
- 6) Chlorpromazine  $\neq$  all except.  
[CAT In Fab colour]

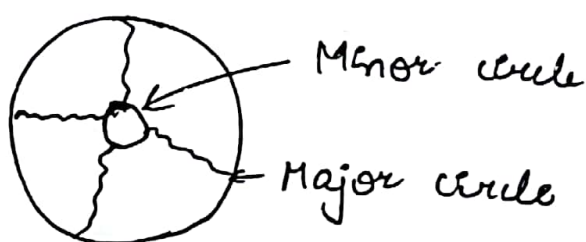
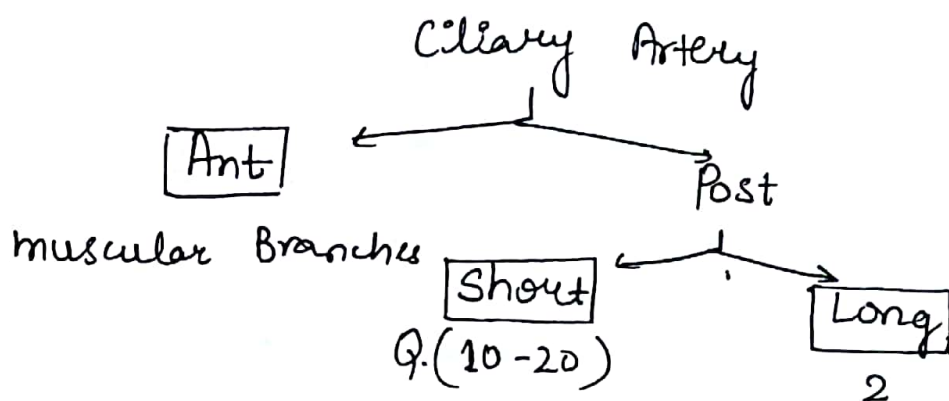
### 37 AUTOIMMUNE OPTIC NEURITIS -

optic neuritis in all connective tissue Disorder

#### 4) ISCHAEMIC ON -

AION  $\rightarrow$  Ant Ischaemic optic neuropathy





Inner 6<sup>th</sup> Layer of Retina  $\Rightarrow$  supplied by Central Retinal artery

Outer 4 Layer of Retina  $\Rightarrow$  supplied by short post-ciliary artery

### A. Ant. Ischaemic Optic Neuropathy

Due to blockage of short Post. Ciliary artery

ARTERITIC

Etiology - Giant cell arteritis

NON-arteritic

Etiology - (X)

Major R/F = HTN

(Nocturnal Hypotension)

## ARTERITIC

1) Sudden painful D/v  
Visual acuity ↓↓↓

2) Amaurosis fugax  
transient loss of vision

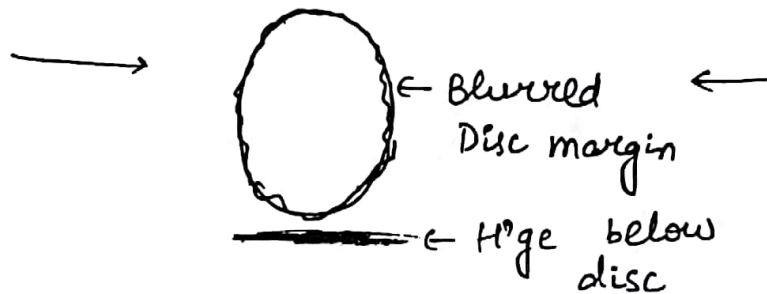
## NON-ARTERITIC

1) Sudden painless D/v  
Visual acuity ↓

2) Altitudinal field Defect



O/E



Rx

I.v. steroids for 4-5 days



Oral steroids

5) HEREDITARY OPTIC NEURITIS/ LEBER'S Hereditary optic neuritis

Mutation in maternal mitochondrial DNA

CF - (R)

followed by

(L)

Optic N.

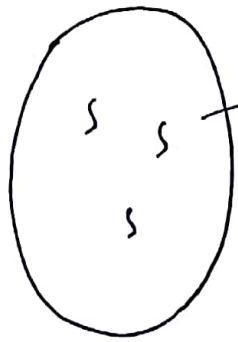
O.N. in other eye.

Optic atrophy

Optic atrophy.

NO APD

Q/E.



Elongated vessels on disc

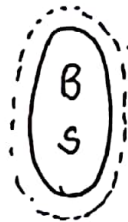
132

No effective Rx.

## PAPILLOEDEMA

Oedema around disc.

- C/F-
- 1) visual acuity (N)
  - 2) Pupillary React (N)
  - 3) Colour (N)
  - 4) Brightness (N)
  - 5) Visual Field Defect-



Q. enlargement of Blind spot

BS - Blind spot

1st Sign of papilloedema → Venous dilatation

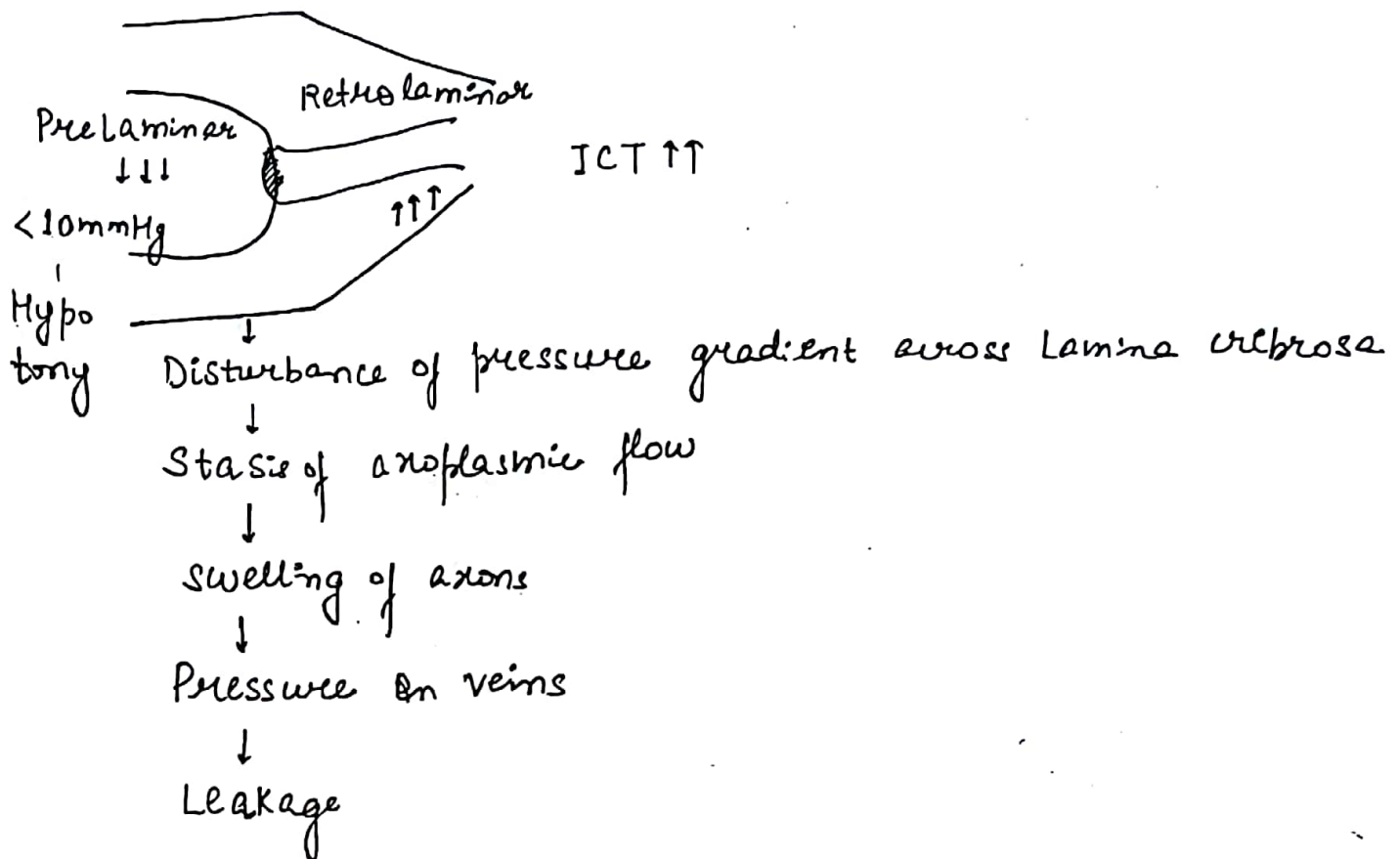


→ Blurred disc margin.

Rx - Rx the cause



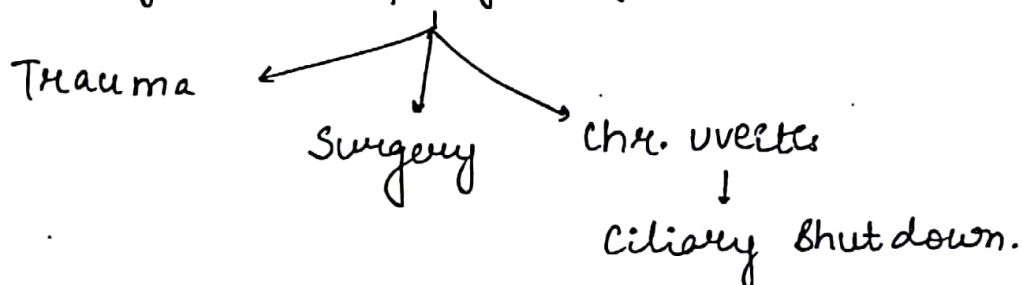
PATHOPHYSIOLOGY



ETIOLOGIES

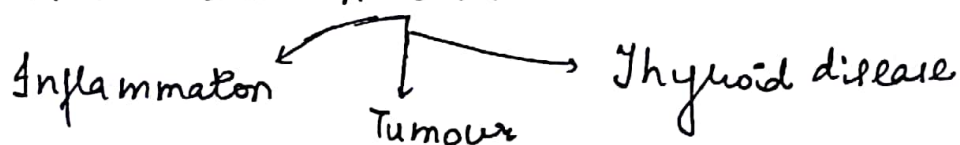
① INTRAOCULAR CAUSE

Any cause of Hypotony

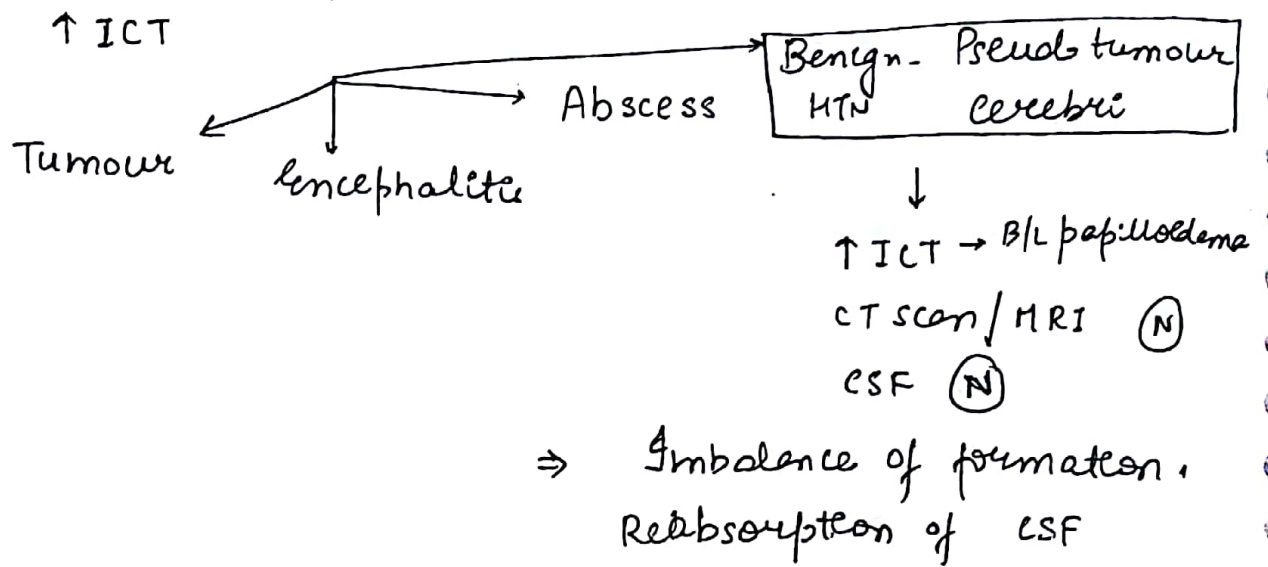


② INTRAORBITAL CAUSE

↑↑ Pressure in orbit



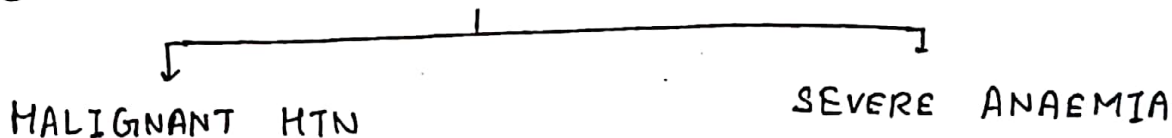
### ③ INTRACRANIAL CAUSE.



#### Causes

- 1) Obesity
- 2) Vit A toxicity
- 3) OCPs
- 4) Tetracycline





### ④ SYSTEMIC CAUSE-



## OPTIC ATROPHY

- All n/v fibres are damaged
- Pt - Blind
- TAPD (Total afferent Pupillary Defect)

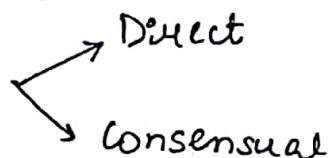
### CLASSIFICATION

<u>1°</u>	<u>2°</u>	<u>Consecutive</u>	<u>Glaucomatous</u>
Cause Brain	optic n/v	Retina	Glaucoma
			
Clear disc margin	Blurred disc margin	clear margin	Cupping nasal shifting
<u>Chalky white</u>	<u>Dirty white</u>	<u>waxy disc</u>	
Multiple sclerosis	Papillitis Papilloedema	Retinitis Pigmentosa	Glaucoma
Neurosyphilis		Diffuse chorioretinitis	

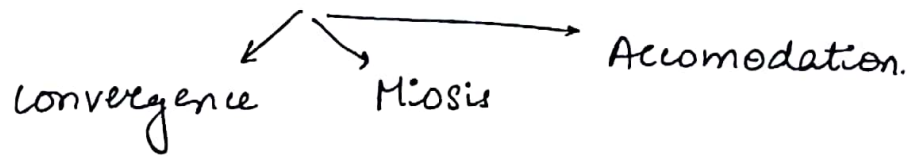
### (N) PUPILLARY REACTIONS

#### ▷ LIGHT REFLEX-

Light → constriction of Pupil

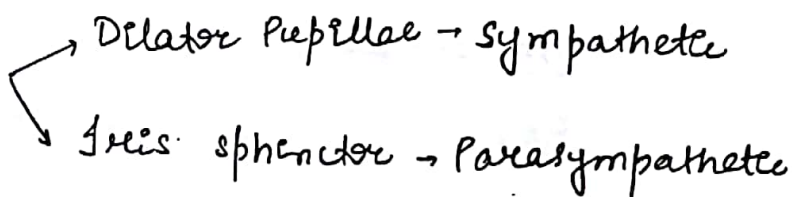


2) NEAR REFLEX / ACCOMODATION REFLEX :-



3) PSYCHOSENSORY REFLEX :-

Anxiety → Dilatation of Pupil



### Ab (N) PUPILLARY REACTIONS

1) RAPD

↳ Retrobulbar neuritis

↳ By swinging flashlight Test

↳ also called Marcus Gunn Pupil

2) TAPD - PR ⊖

↳ Optic atrophy

3) Argyll Robertson Pupil

Light - Near Dissociation.

Accommodation Reflex +nt, Light Reflex ⊖  
due to Lesion in "Pretectal Nucleus"  
Neurosyphilis.

#### 47 HOLMES - ADIE / TONIC PUPIL:-

- C/F-1) sluggish Light Reflex  
 2) " Accommodation Reflex  
 3) " Tendon Reflex.

Q. Position of Pupil → "MID-DILATED"

Vermiform movement of iris seen.

#### 57 HORNER SYNDROME

Lesion of "sympathetic chain."

C/F → 1) Ptosis

↳ mild

LPS → 1<sup>st</sup> n/v  
 Muller → sympathetic  
 ↓  
 2mm of lid elevated

2) Miosis

↳ due to uninhibited action of iris sphincter

3) Enophthalmos

↳ due to ptosis, apparent enophthalmos.

4) Anhidrosis

↳ loss of sweating

5) Loss of cilio-spinal reflex

↳ Pinching @ nape causes dilatation of pupil

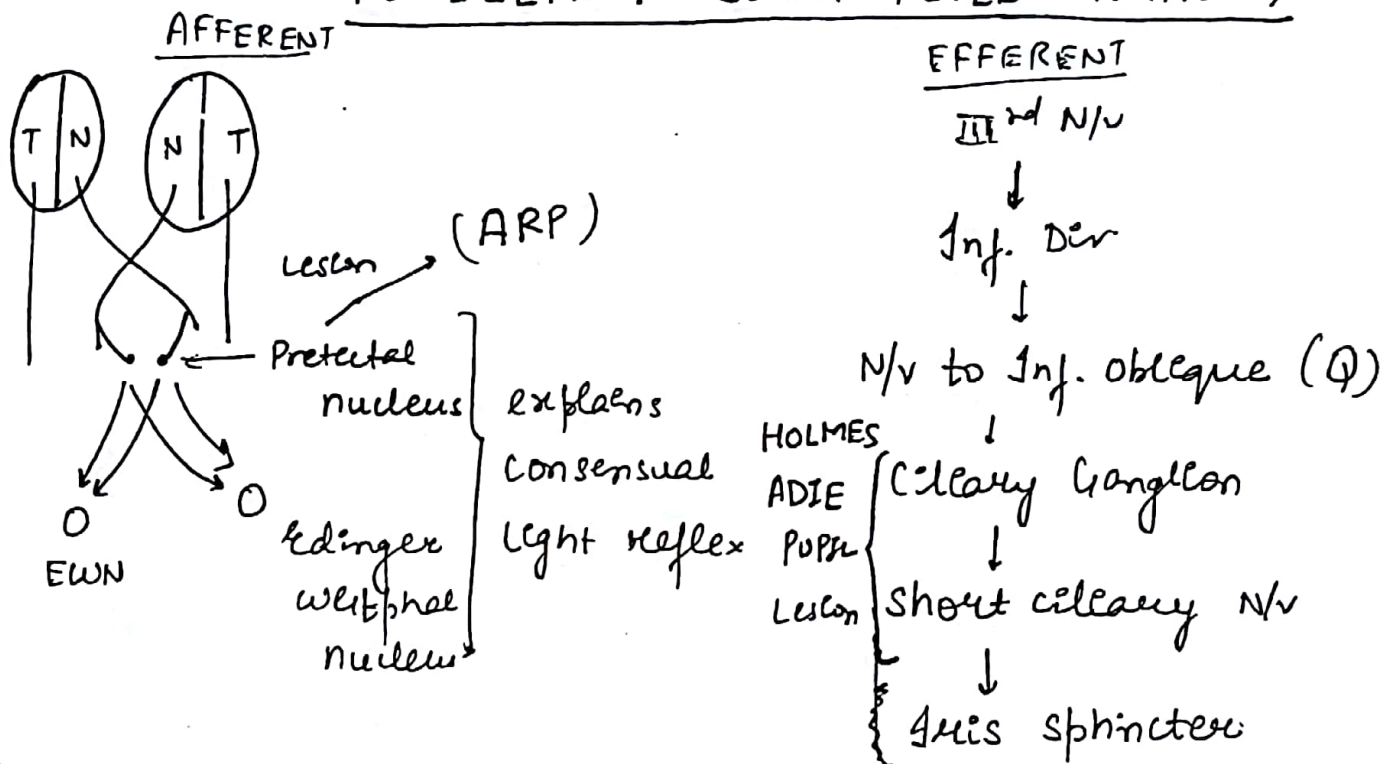
Best described by → ① Ptosis + ② Miosis



Q. Horner is (B) Congenital + Acquired

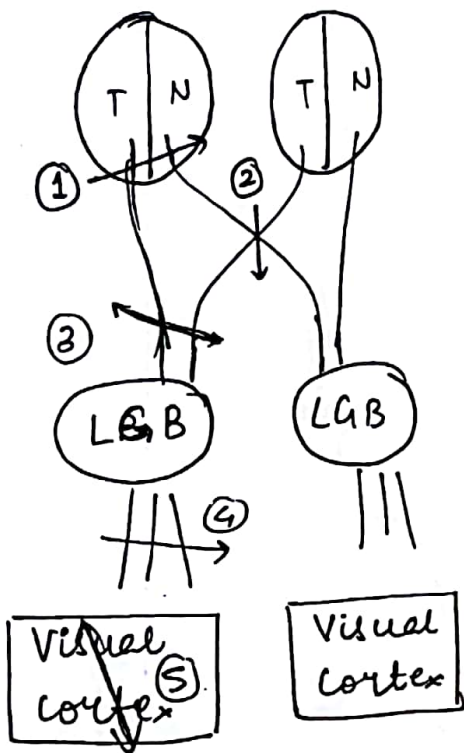
Congenital → Heterochromia iridis.

## PUPILLARY LIGHT REFLEX PATHWAY

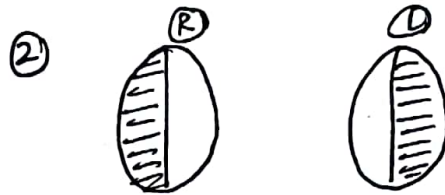


- \* 2 Internal m/s supplied by III<sup>rd</sup> n/v
- 1) Iris sphincter
  - 2) Ciliary m/s

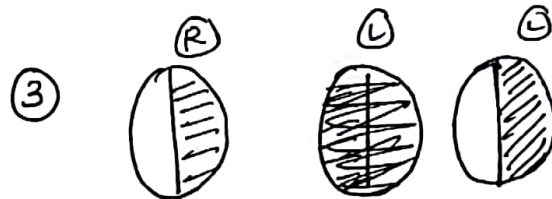
# LESIONS OF VISUAL PATHWAY



① Ipsilateral Blindness

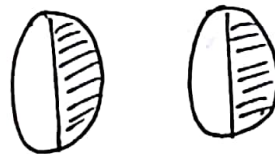


Bitemporal Hemianopia / Heteronymous



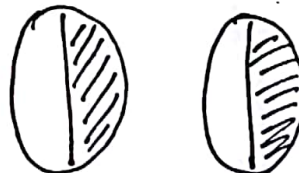
Incongruous Homonymous Hemianopia  
↓  
Sutoma not in continuity

④



Incongruous / Congruous Homonymous Hemianopia

⑤



Congruous Homonymous Hemianopia

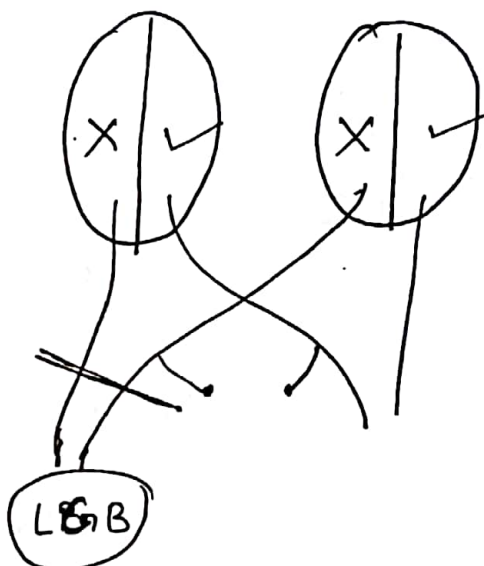
only Lesions  $\subseteq$  are Heteronymous = CHIASMAL

Chiasma is affected in  
 Pituitary Adenomas  
 Craniopharyngiomas  
 Aneurysm circle of Willis.

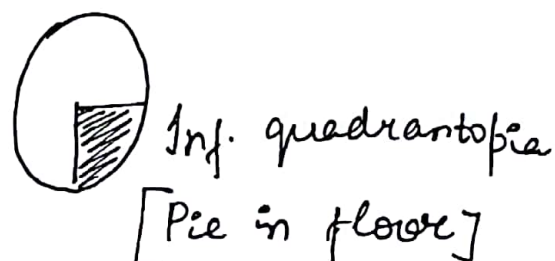
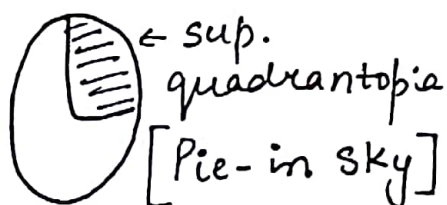
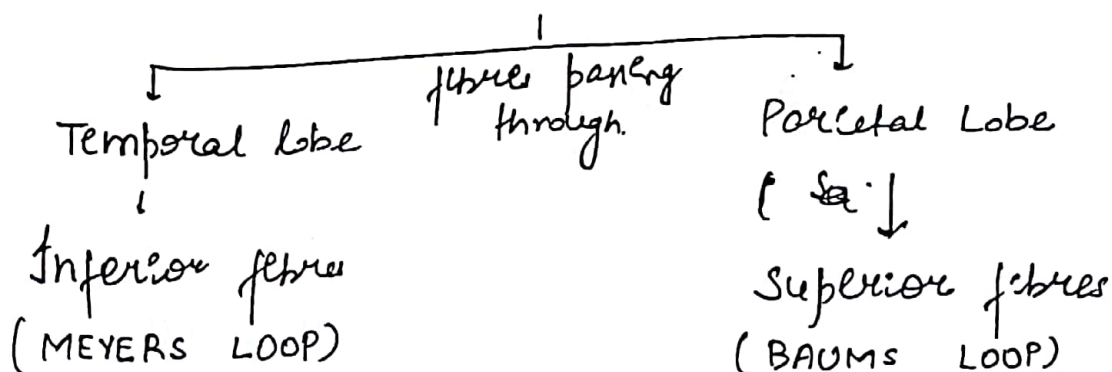
### WERNICKE'S HEMIANOPIC PUPIL:-

feature of optic tract Lesion.

Radiation Lesion +  
 Cortical Blindness  
 Pupillary Reac<sup>n</sup> are  
 (N)



### OPTIC RADIATION

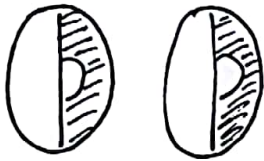


# VISUAL CORTEX

141

supplied by

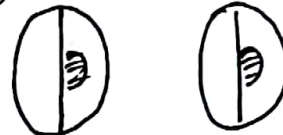
Post. cerebral Artery



Macular sparing  
Hemianopia

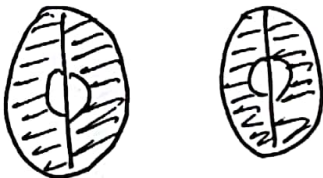
Middle cerebral Artery

supplies Macular area



Total macular H.H. seen when  
there is direct trauma to  
macular area

(B) side PCA gone



Keyhole / vision  
Tunnel

Not seen in vascular blockage  
as (B) arteries supply macula

1°  
17,

2°  
18, 19

Visual association areas.

I

II

III

IV → Thickest Layer. a, b, Cd, Cp

V

VI

Q. Max. optic Radiation fibres terminate in Layer IV of visual cortex.

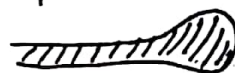
### LATERAL GENICULATE BODY

I } Magnocellular  
II }

III } Parvocellular  
IV }  
V }  
VI }

Q  
1, 4, 6 → C/L supply  
2, 3, 5 → I/L supply

Q  
Keyhole visual field  
Defect



### HORIZONTAL GAZE CENTRE

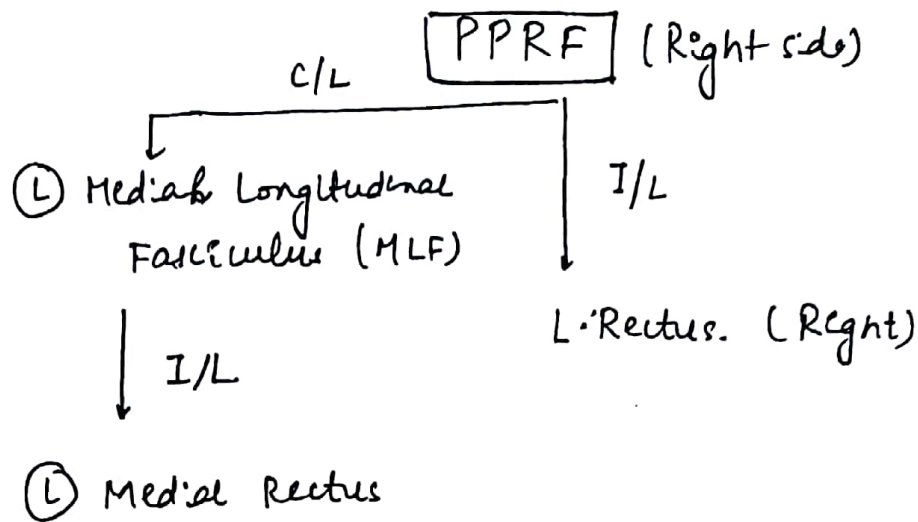
YOLK H/s → e/L synergists.

H/s of Diff eye → synergising action

Horizontal Gaze centre → PONS. - PPRF

(Paramedian Pontine Reticular Formation)





Any Lesion of MLF → Internuclear ophthalmoplegia (INO)

### INO

- 1) Defective I/L adduction (Medial Rectus won't work due to Lesion of MLF)
- 2) C/L abducting eye shows ataxic nystagmus

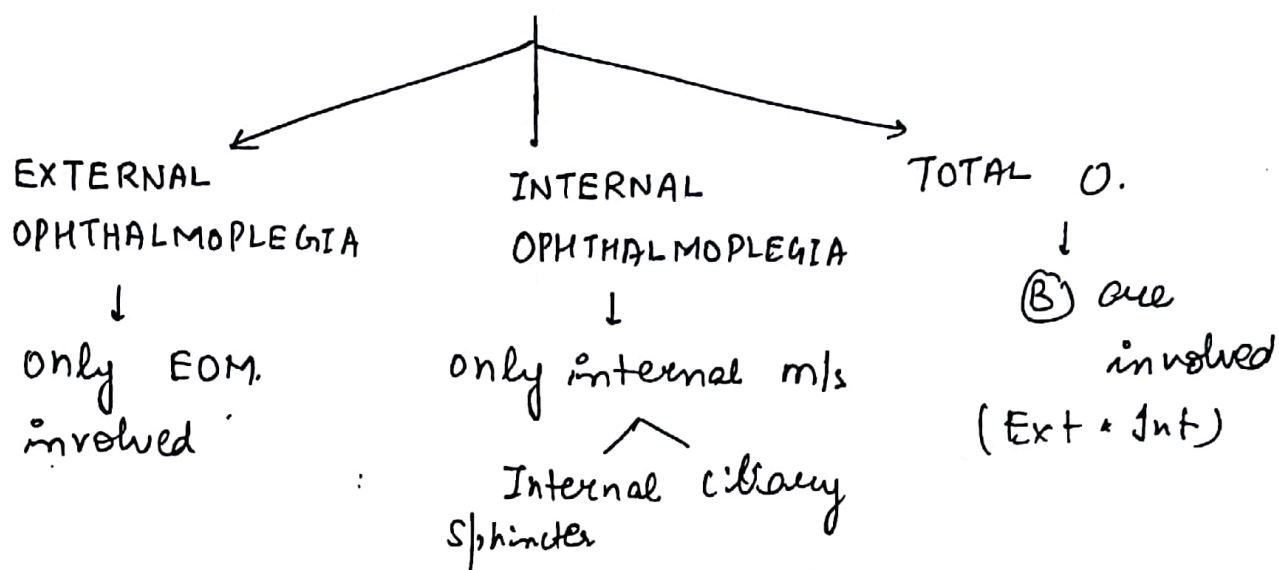


### III<sup>rd</sup> NERVE PALSY

- 1) Down + Out + Intorted

Depressed + Abducted

- 2) Defective / Restricted ocular movement
- 3) Ptosis
- 4) Fixed & dilated Pupil
- 5) Accommodation → absent



Q. WEBER'S SYNDROME

$\text{III}^{\text{rd}}$  N/V Palsy + C/L Hemiplegia

Q. BENEDICT'S SYNDROME

$\text{III}^{\text{rd}}$  N/V Palsy + C/L Hemitremors

Q. MIUARD - GUBLER SYNDROME

$6^{\text{th}}$  N/V Palsy + C/L Hemiplegia

Q. FOSTER - KENNEDY SYNDROME

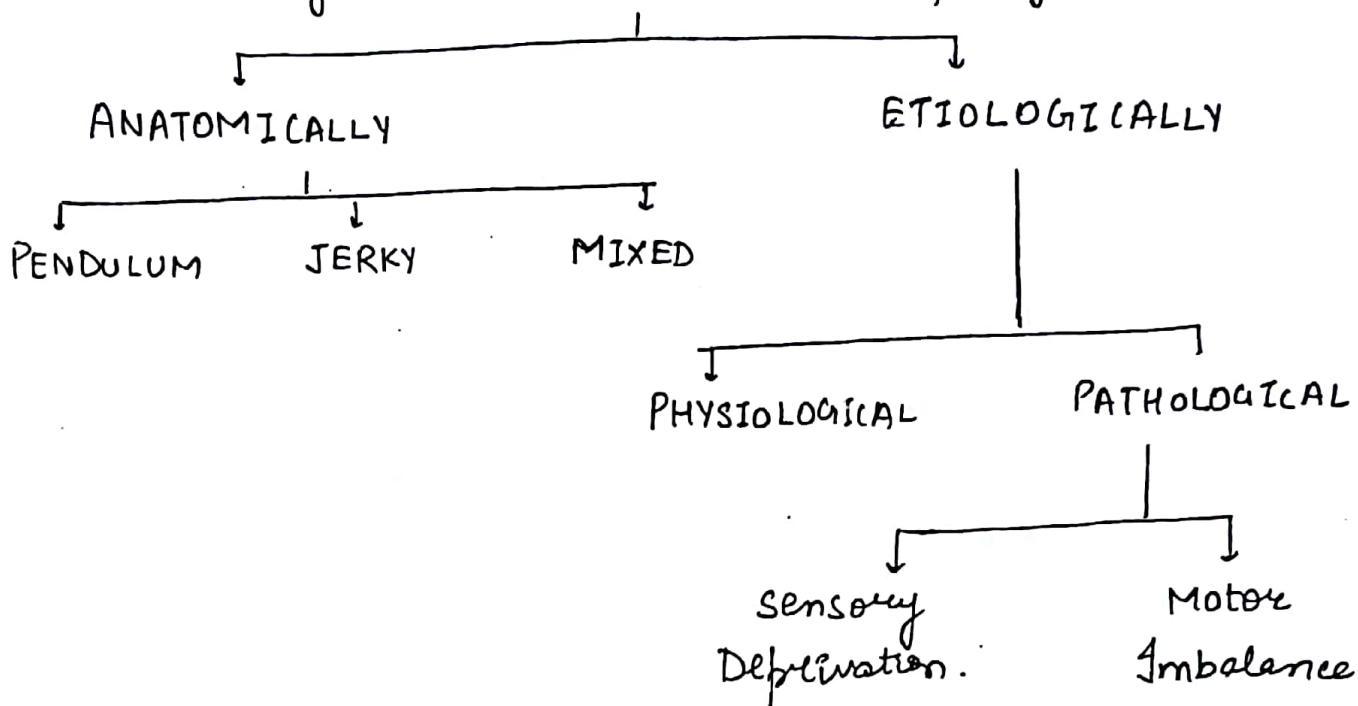
→ IL optic atrophy

→ CL Papilloedema

Frontal lobe Tx & olfactory groove Tumours

## NYSTAGMUS

Involuntary To & Fro Movement of Eye



### PHYSIOLOGICAL

- 1> Extremes of Gaze
- 2> Oculovestibular Reflex (cows)
- 3> Optokinetic Nystagmus (OKN)

Saccadic

Pursuit

Fast abrupt movement  
to reflex object on  
fovea

Slow following movement

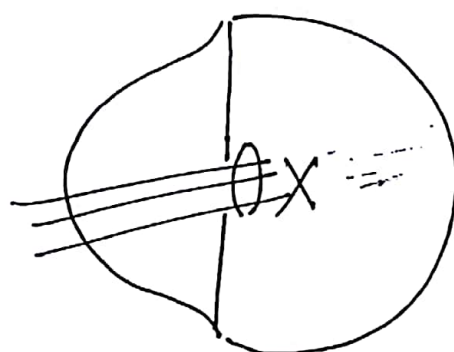
- ⊗ Defective optokinetic Nystagmus  
↳ Lesion → Parietal Lobe

## Q Optokinetic Drum Test -

Objective Test to catch malingering  
Functional Blindness

### PATHOLOGICAL

#### (I) SENSORY DEPRIVATION



Foveal reflex  
develops by 5-6 months

Opaque media in 5-6 months of age  
can lead to nystagmus

↓  
Pendular

#### (II) MOTOR IMBALANCE

Q 1) ATAXIC NYSTAGMUS → INO

2) LATENT " → Infantile Esotropia

↓  
Converging squint  
< 1 yr of age

Manifest by Cover-Uncover test

3) SPASMUS NUTANS

Nystagmus + Head Nodding  
Pendular

## 4) DOWNBEAT NYSTAGMUS

Arnold Chiari  
malformation

Cerebellar Lesions

## 5) UP BEAT NYSTAGMUS

Post. Fossa  
Lesions

Phenytoin Intoxication

## 6) SEE-SAW NYSTAGMUS

Seen in Chiasmal Lesions. (Bitemporal  
Hemianopia)

All are jerky except spasmus nutans

\* PASS-POINTING NYSTAGMUS

Nystagmoid movement  
feature of cerebellar lesion

• MINER'S NYSTAGMUS

Rotatory



## ORBIT

Q 30cc

Q shape - QUADRILATERAL / PYRAMIDAL

Q weakest wall - MEDIAL WALL

↓  
due to cribriform plate of ethmoid sinus  
"Lamina papyracea"

Q BLOW OUT # -

Floor # due to blunt trauma.

M/c site = Medial to Inf. orbital fissure  
(Posteromedial part)

## PROPTOSIS

Protrusion of Eyeball -

Lateral orbital margin → apex of cornea  
> 21 mm -

or difference between 2 eyes > 2mm

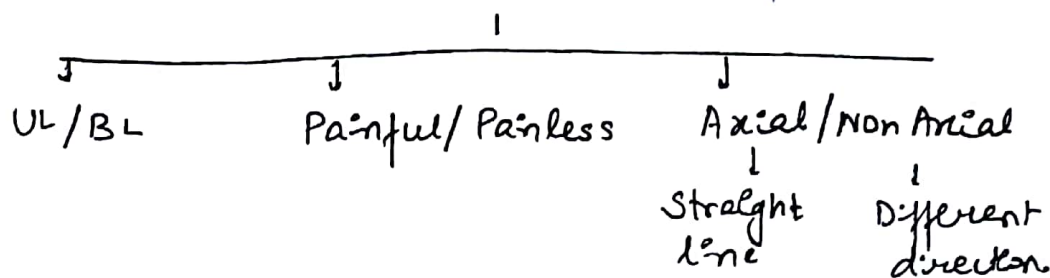
EXOPHTHALMOS - for thyroid disease

EXOPHTHALMOMETER - used for measurement of exophthalmos.

Commonest → Hertel's exophthalmometer

In children → Leudde's exophthalmometer

## CLASSIFICATION



## THYROID OPHTHALMOPATHY/ GRAVE'S EYE DISEASE/

→ Autoimmune disease

→ ♀

→ Q. Pt. can be Euthyroid/Hypothyroid/Hyperthyroid

G/F -

1) Ptosis

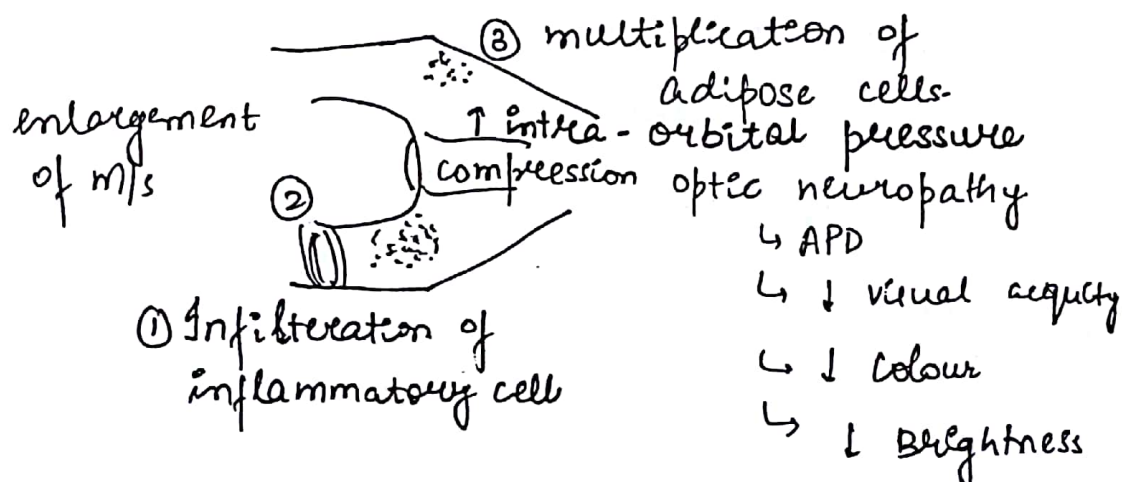
2) Optic neuropathy

3) MYOPATHY

4) Soft tissue signs

5) LID signs

## PATHOPHYSIOLOGY -



Rx =

1) Systemic steroids

2) Radiotherapy → anti-inflammatory role of radio

3) Severe → Decompression Sx

↳ Involves breaking orbital wall

Q. sequence of wall to be broken

Medial  
↓  
Inferior  
↓  
Lateral

## MYOPATHY

Restrictive Myopathy

C/F → Diplopia

→ Squint

Rx → squint surgery

For an underacting m/s ⇒ Resection done

For overacting m/s ⇒ Regression

1st m/s → Inf. Rectus

Last m/s → Inf. Oblique

Part of m/s involved - Belly

Q. 1st Defective movement → Elevation  
as the inf. rectus is fibrosed, so  
doesn't allow elevation.

### FORCED DUCION TEST-

To differentiate between

Paralytic  
pathology



\* sup. oblique can be  
elevated by  
forcep

Restrictive  
pathology



can't be elevated due  
to fibrosis.

### SOFT TISSUE SIGN

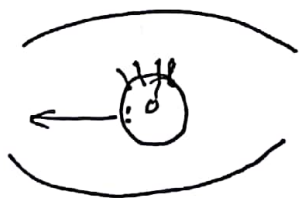
1) edema around eyes

2) Chemosis

↳ cong

3) Sup. Limbic Keratoconjunctivitis Q

mucus  
deposition



Rx = 1) Adrenaline E/D

2) Acetylcysteine E/D  
↳ to dissolve mucus

## LID                      SIGNS

- ① LOCATION - upper lid 2mm below limbus  
Lower lid touches limbus

Lid signs are due to overaction of LPS m/s

- 1> DALRYMPLE SIGN → Lid Retraction
- 2> VON GRAEFE → Lid Lag.
- 3> KOCHER'S SIGN → staring LOOK.  
(extreme lid retraction)
- 4> STELLWAG SIGN → ↓ frequency of Blinking

R<sub>x</sub> - Recession of LPS (overactive m/s + Ad by recession)

Q. medical Rx of Lid Lag - GUENETHIDINE E/D.

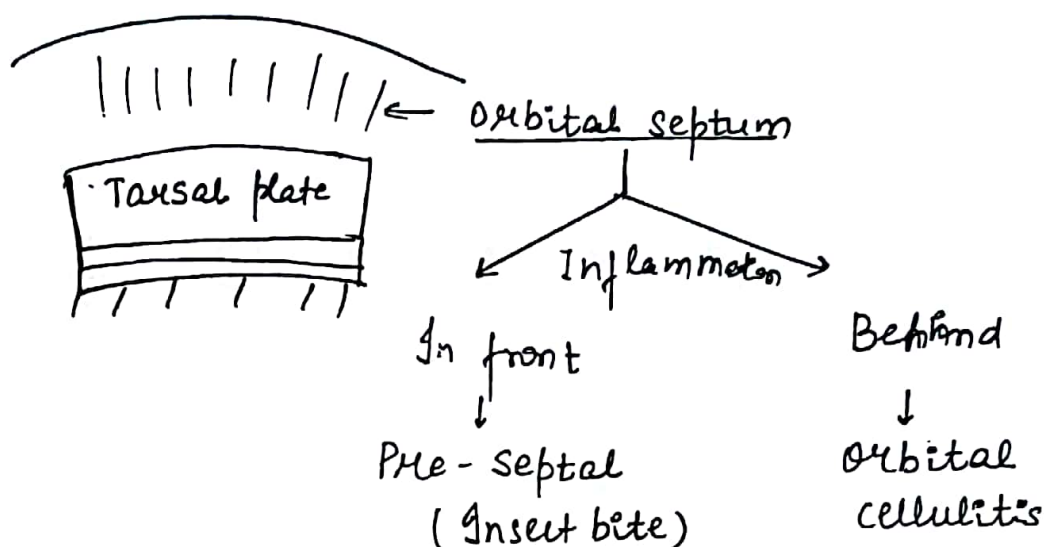
\* SEQUENCE OF Sx Done In THYROID -

D Decompression  
↓  
S Squint  
↓  
SL Lid surgery



## ORBITAL CELLULITIS

### ANATOMY



### C/F of ORBITAL CELLULITIS

- 1) U/L
- 2) Painful proptosis
- 3) Restricted eye movement (Due to proptosis)  
↳ 3, 4, 6 n/v not involved
- 4) Fever & malaise

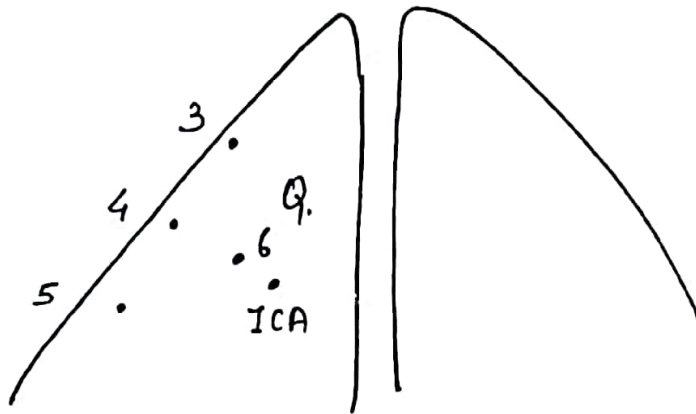
R<sub>x</sub>

Q. Ocular EMERGENCY → Bcoz of risk of causing cavernous sinus thrombosis

- Admit pt
- start i/v Antibiotics < aerobic
- I/V anti-inflammatory < anaerobic

# CAVERNOUS SINUS THROMBOSIS

## ANATOMY



C/F -

Q/Q 1st sign → 6<sup>th</sup> n/v palsy

2) 3, 4, 6 are involved → causing total restriction of eye movement

3) Absent → L. Reflex

4) Absent → Acc. Reflex.

5) 5<sup>th</sup> → Absent Blink Reflex

6) B/L Painful Proptosis

7) B/L Papilloedema

8) Mastoid tenderness.

9) ptosis all except Q.

Rx, IV antibiotics  $\begin{cases} \text{aerobic} \\ \text{anaerobic} \end{cases}$

2) IV anti-inflammatory

Prognosis - Poor

## LACRIMAL GLAND TUMOUR.

NON - AXIAL

**BENIGN**

Benign mixed Ta/  
Pleomorphic adenoma  
↑ H/c Tx

**MALIGNANT**

- 1) Pleomorphic Adenocarcinoma
- 2) Mucoepidermoid
- 3) Adenoid-cystic
  - ↳ H/c malignancy
  - Most dangerous malignancy
  - ↓
  - due to perineural invasion.

## PULSATING PROPTOSIS

by CAUSES :-

- 1) Carotico-cavernous fistula (CC) ← H/c
  - 2) # Roof
  - 3) NF-1
- } Intracerebral pulsations are transmitted

## INTERMITTENT PROPTOSIS

156

changes in head posture

Cause - Orbital Varices QQ

ONE - LINERS -

QQ. M/c Intraocular malignancy

Children

Adults

RETINOBLASTOMA

1) CHOROZDAL MALIGNANT  
MELANOMA

2) METASTASIS

Q M/c Intraorbital Malignancy

Children

Adults

RHABDOMYOSARCOMA

NON-HODGKIN'S LYMPHOMA  
B cell type

Q. M/c Intra-orbital Tx of adults = CAVERNOUS  
HEMANGIOMA

Capsulated, so easily resected

## OPTIC N/V GLIOMA = ASTROCYTOMA

all Non-neuronal cells of nervous system → Glial cells

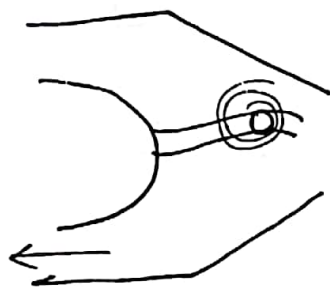
EXAMPLES-

- 1) Oligodendrocytes
- 2) Astrocytes
- 3) Neuroglial
- 4) Microglial etc

C/F-

157

- 1) Disease of childhood
- 2) More common in ♀
- 3) U/L
- 4) very slow growing Tx
- 5) M/c - NF-1 > 2 Q Q.



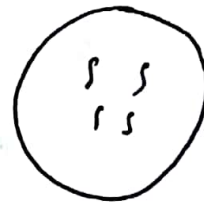
when size of Tm ↑

Proptosis is a late feature

Initial signs → optic n/v disease

M/c pathological type - Pilocytic astrocytoma

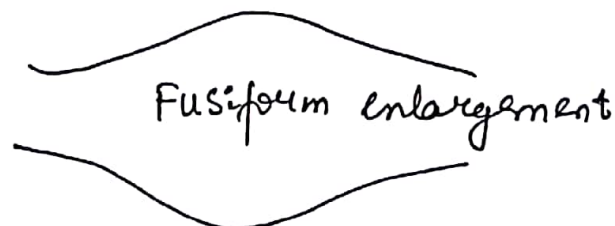
hair like



Inv:-

1) MRI

2) CT Scan



Rx-

- 1) Observation
- 2) Radiotherapy
- 3) Surgery

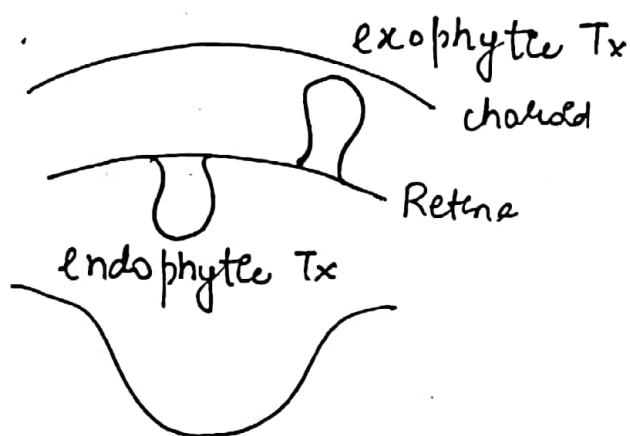


## RETINOBLASTOMA

From Neuroectodermal cells → Retinoblasts.

**C/F**

- 1) M/c age of presentation - (c 3 yrs)  
Commonest → 18 months
- 2) M/c mode of presentation - LEUCOCORIA  
(white eye reflex)  
Amaurotic Cat's eye Reflex
- 3) 2<sup>nd</sup> M/c mode of presentation = STRABISMUS
- 4) Glaucoma
- 5) Pseudohypopyon → Tx cells in ant. chamber
- 6) Pseudo uveitis
- 7) Orbital cellulitis



**D/D** -

PSEUDOGLIOMAS (① → ⑩) 159

- 1) Congenital Cataract - M/c cause of Leucocoria
- 2) Cystic membrane
- 3) Fungal endophthalmitis
- 4) Central choroiditis - Toxocariasis
- 5) Central coloboma - sclera shine white as central part not formed
- 6) PHPV
  - ↳ persistent hyperplastic 1° vitreous
- 7) ROP
  - ↳ Retinopathy of prematurity
- 8) Coat's Disease
  - a) Retinal Dysplasia
- 10) Central Retinal Detachment

Q. Differentiating Pt. Bet<sup>n</sup> RB & Pseudoglioma?

Retinoblastoma → IOP ↑

Pseudo glioma → (N)

Q Benign counterpart of RB → RETINOCYTOMA

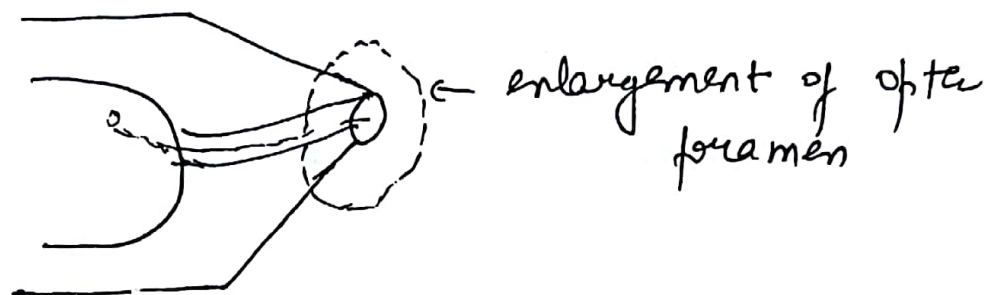
**Inv** -

Q. 1) 1st Inv → USG (B) scan

2) CT scan - for intracranial extension

3) MRI - for Pinealomas → IOC

4) X-Ray - Rhese view  
- optic foramen.



H/c mode of spread - through optic n/v & ATIMS

5) Estimation of enzymes in aqueous humour  
↑↑↑ in RB

LDH

(Lactose Dehydrogenase)

PGI

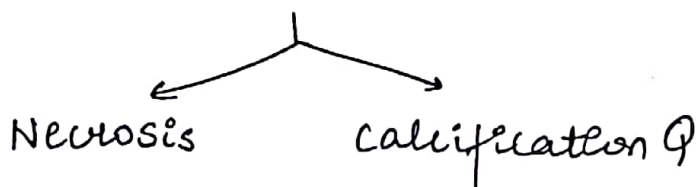
(Phospho glucos  
isomerase)

NSE

(neuron-specific  
enolase)

## PATHOLOGY :-

Gross -



Microscopic -

Differentiated

Un-differentiated

1) HOMER - WRIGHT

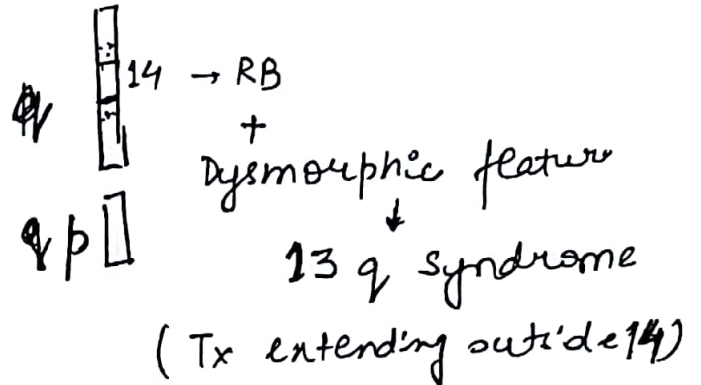
2) FLEXNER - WINTERSTEINER

3) FLEURETTES

# GENETICS

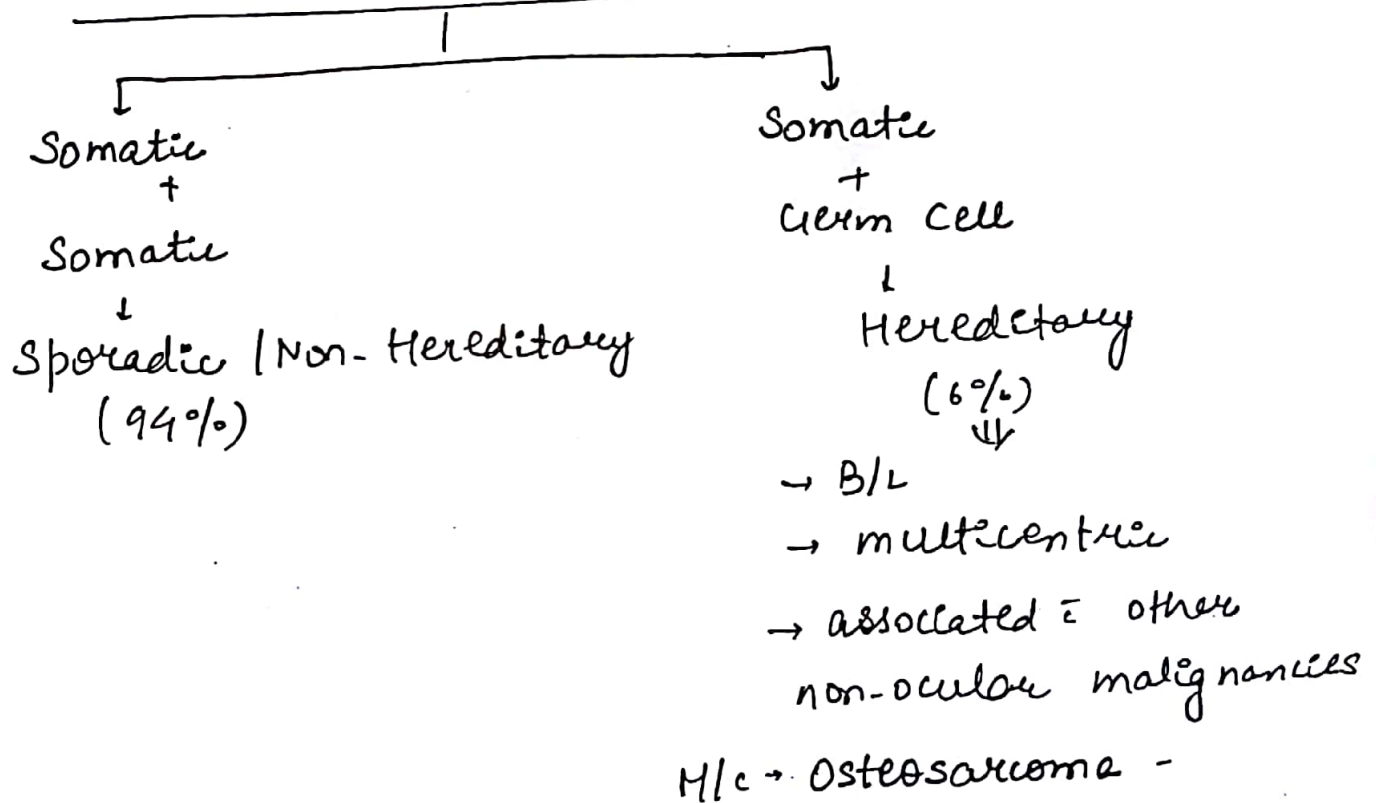
161

▷ QQ. M/c mutation = 13q



2) Bilateral RB  
= B/L RB + Pinealoma

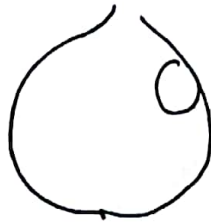
## KNUDSONS TWO - HIT HYPOTHESIS



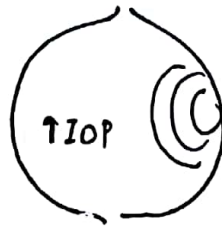
# STAGING

162

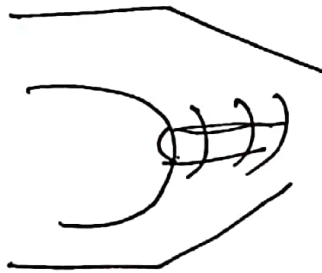
① QUIESCENT



② GLAUCOMATOUS



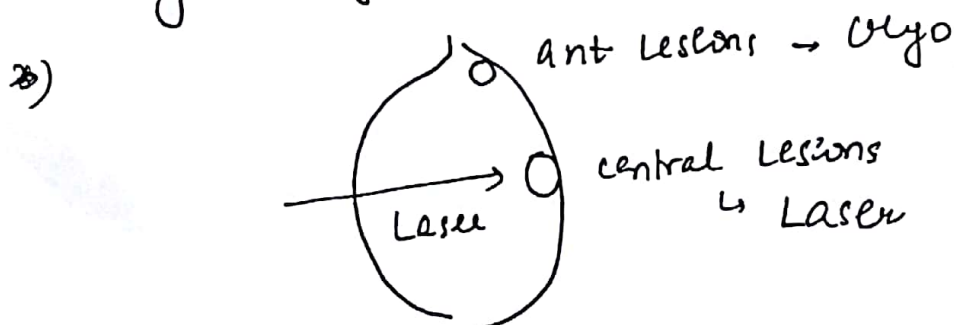
③ STAGE EXTRAOCULAR EXTENSION



④ DISTANT METASTASIS

Rx -

- 1) Laser Photocoagulation
  - 2) Cryotherapy
- can be used if  $T_x \leq 3$  mm in height  
→ Damage blood supply of  $T_x$





## 3) Radiotherapy

EBRT  
(Ext Beam RT)



Brachytherapy

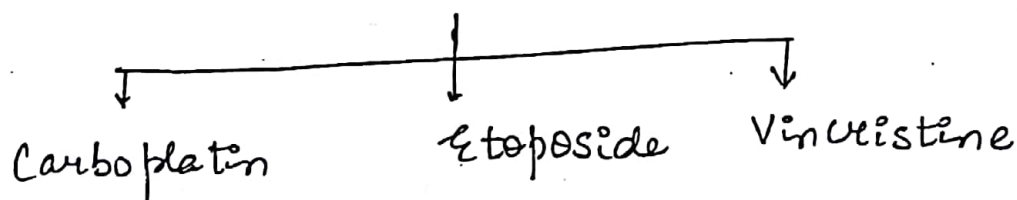


## 4) Thermotherapy

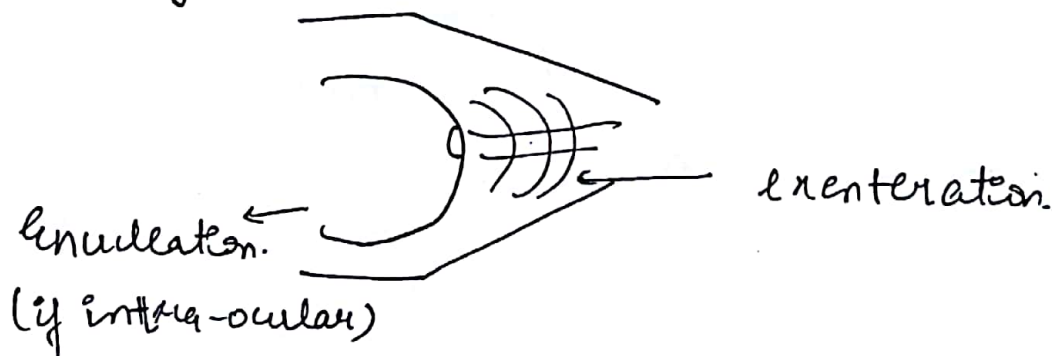
↳ thermal effect of diode is used to damage tumour.

## 5) Chemotherapy

Neoadjuvant role  $\rightarrow$   $\downarrow$  size of Tx



## 6) Surgery

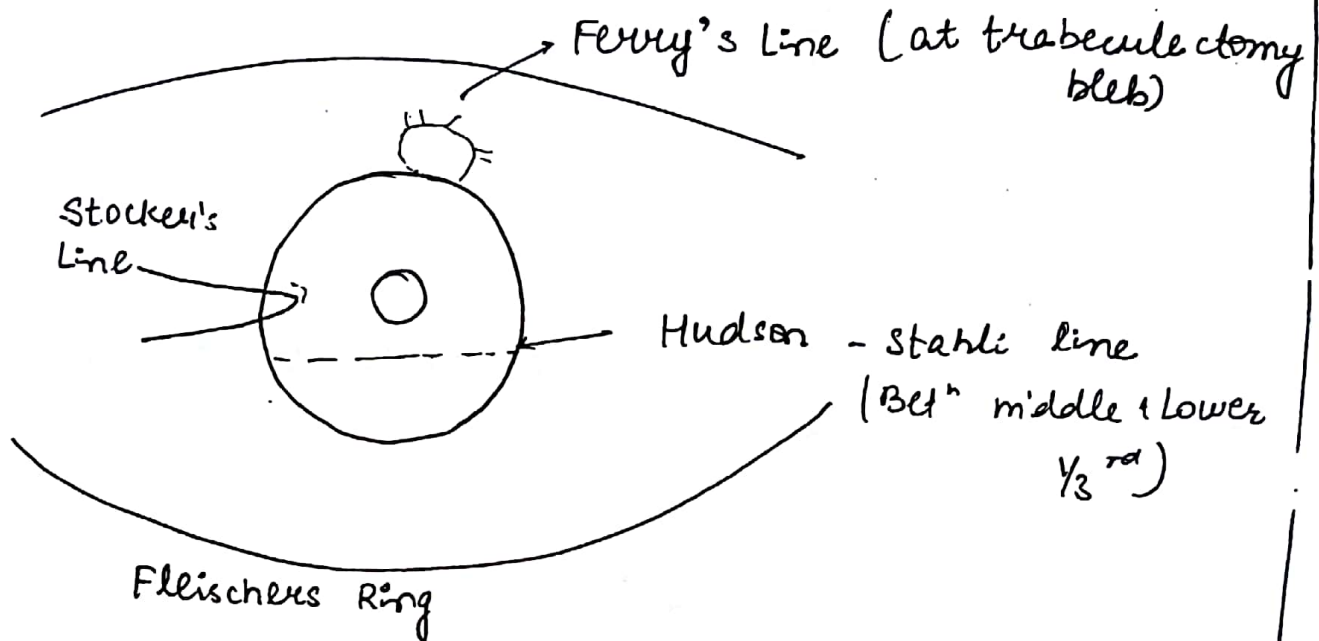


# SURGERIES TO REMOVE EYE

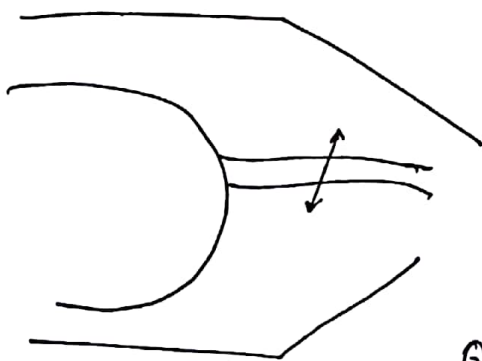
164

EXTRA - NOTE.

## IRON DEPOSITION



## ENUCLEATION



Enucleation = removal of eyeball  
+ max part of optic n/v

Q 10mm → 15mm  
(part removed)

Q c in 10 day / same sitting  
Put orbital implant

↓ 6-8 wks Q  
Prosthetic eye

## EXENTERATION

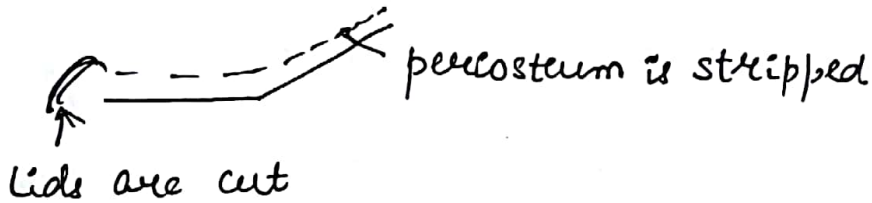
165

→ Removal of all orbital contents

\* Indication-

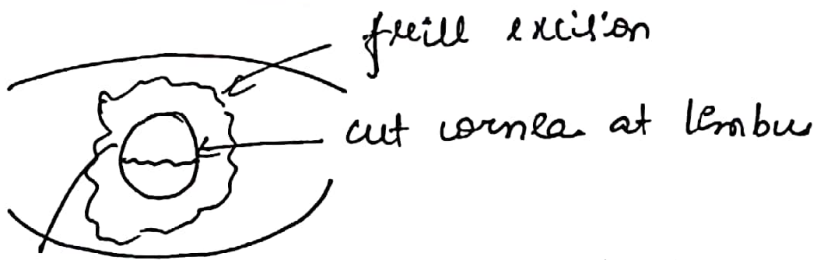
$$17 \quad T_x$$

## 27 Mucormycosis



### Grafting for cosmetic reasons

# EVisCERATION



steak the remaining sclera

If sclera is also inflamed  $\rightarrow$  remove max part of sclera  
leave a full sclera

## Full Excision

Indication - Pan ophthalmites

Artificial eye → prosthesis

## PANOPHTHALMITIS & ENDOPHTHALMITIS

D/D - endophthalmitis

PAN

Restricted ocular movement

Other C/F -

- D/V
- No fundal glow
- ~~Glow~~ Pain.

ENDU

No restriction.

Inflammation of inner coat of eye

Retina      vitreous

Other features are some

Rx = Intravitreal

Antibiotic injec<sup>n</sup>

↓  
Ceftazidime → Gram-ve

Vancomycin → Gram. +ve

Dexamethasone - very small doses to control inflammation

Antibiotic C/I Intra-vitreally -

Gentamicin

Amikacin

Maculotoxic

Antifungal → Intravitreally Given

167

Amphotericin B      Voriconazole

## BLOW - OUT #

Floor # due to Blunt Trauma

\* Mechanism → BUCKLING effect

\* C/F →

1) Periorbital ecchymosis → BLACK EYE / PANDA EYE

RACCON EYE → B/L

seen # Base of skull

2) ↓ sensation of affected cheek

↳ Damage to infra-orbital n/v

3) Enophthalmos

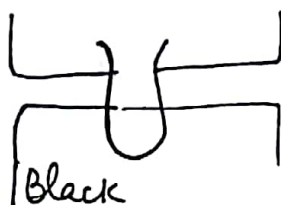
4) Diplopia

5) Subcutaneous Emphysema  
(if medial wall broken)

\* Inv :-

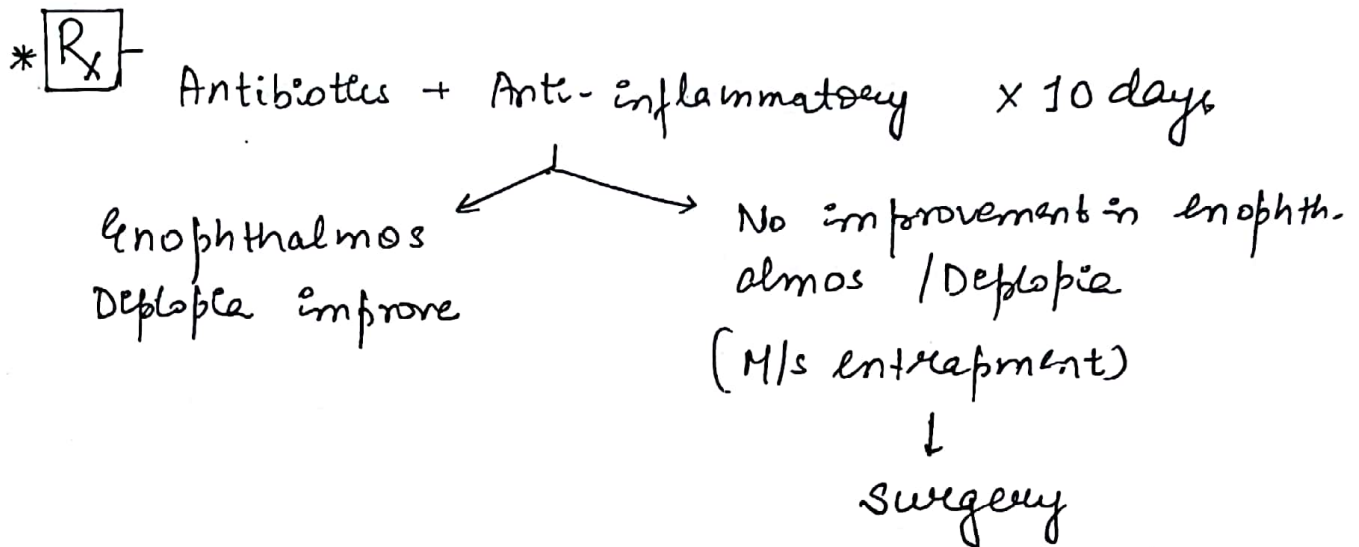
1) X-Ray → Water's View / PNS

2) CT Scan -



White opacity against  
Black Background  
= TEAR DROP SIGN

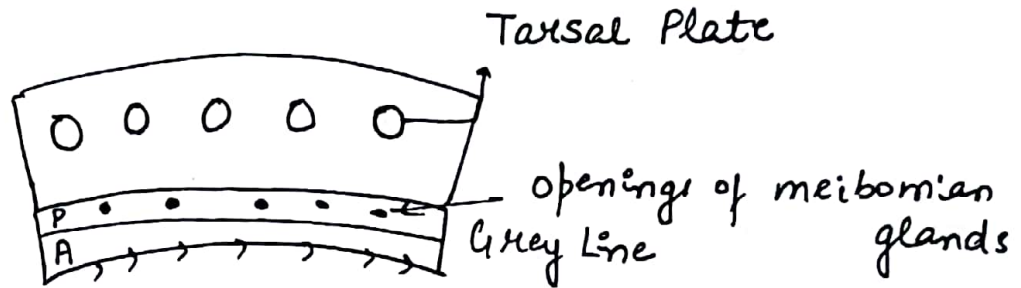




# LIDS

169

## ANATOMY



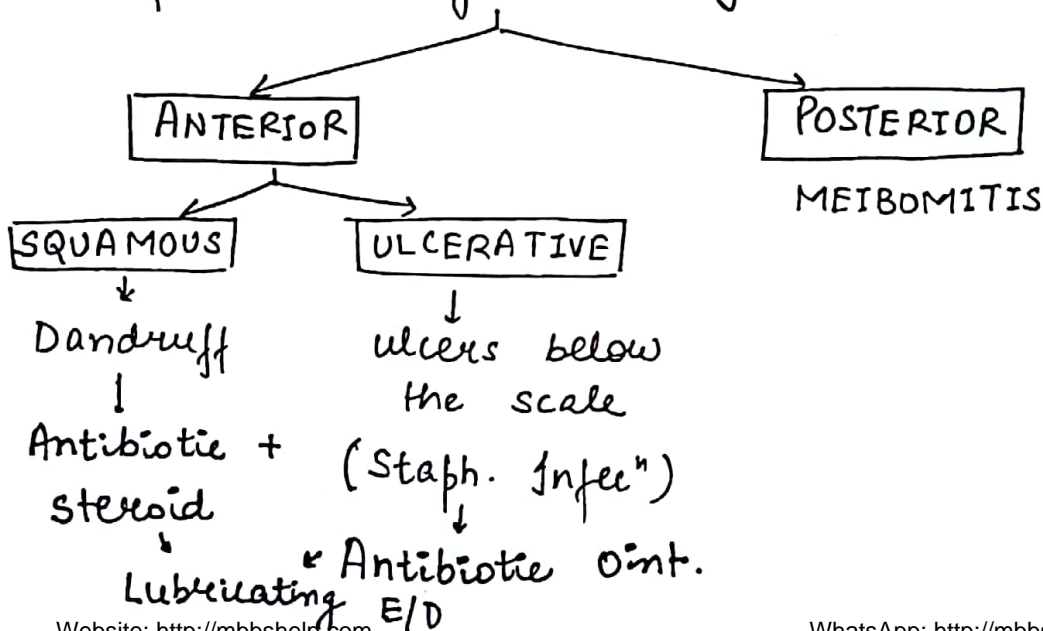
1. TRICHIASIS → misdirection of eyelashes.

2. POLIOSIS → greying of eyelashes

3. MADAROSIS → Loss of eyelash → CAUSE Chronic Blepharitis  
" " eyebrows  
↓  
CAUSES  
Leprosy  
Myxoedema

4. BLEPHARITIS -

Inflammation of Lid margin



5) TYLOSIS -

Q Thickening of Lid Margin

170

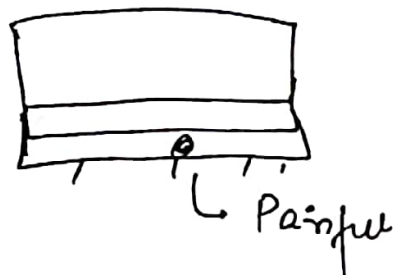
6) ECTROPION -

Outward turning of Lid Margin

7) ENTROPION -

Inward turning of Lid Margin

8) HORDEOLUM EXTERNUM / STYE



→ Staph. Infection of 1) Hair follicle of  
② Gland of Zeis / ③ Gland of Moll

Rx = 1) Hot fomentation

2) Epilation

3) Oral anti-inflammatory

4) Antibiotic ointment

9) HORDEOLUM INTERNUM

Acute inflammation of Meibomian Glands.



C/F - Painful swelling on lid

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R<sub>x</sub> - 1) Hot Fomentation

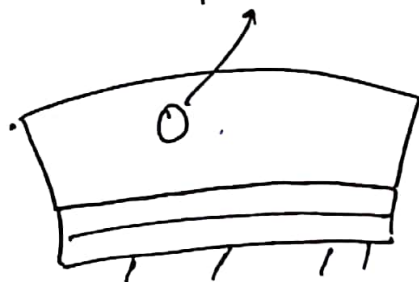
2) Oral antibiotics

3) Oral anti-inflammatory

### 10) CHALAZION -

→ Chronic Lipogranulomatous Inflammation of meibomian glands

→ Present as painless swelling



R<sub>x</sub> = 1) Incision + curettage

2) Intralesional Injec<sup>n</sup> of Triamcinolone acetate

Q. Recurrent Chalazion →

← M/c cause  
Uncorrected mild  
refractive error

Q. sebaceous cell carcinoma

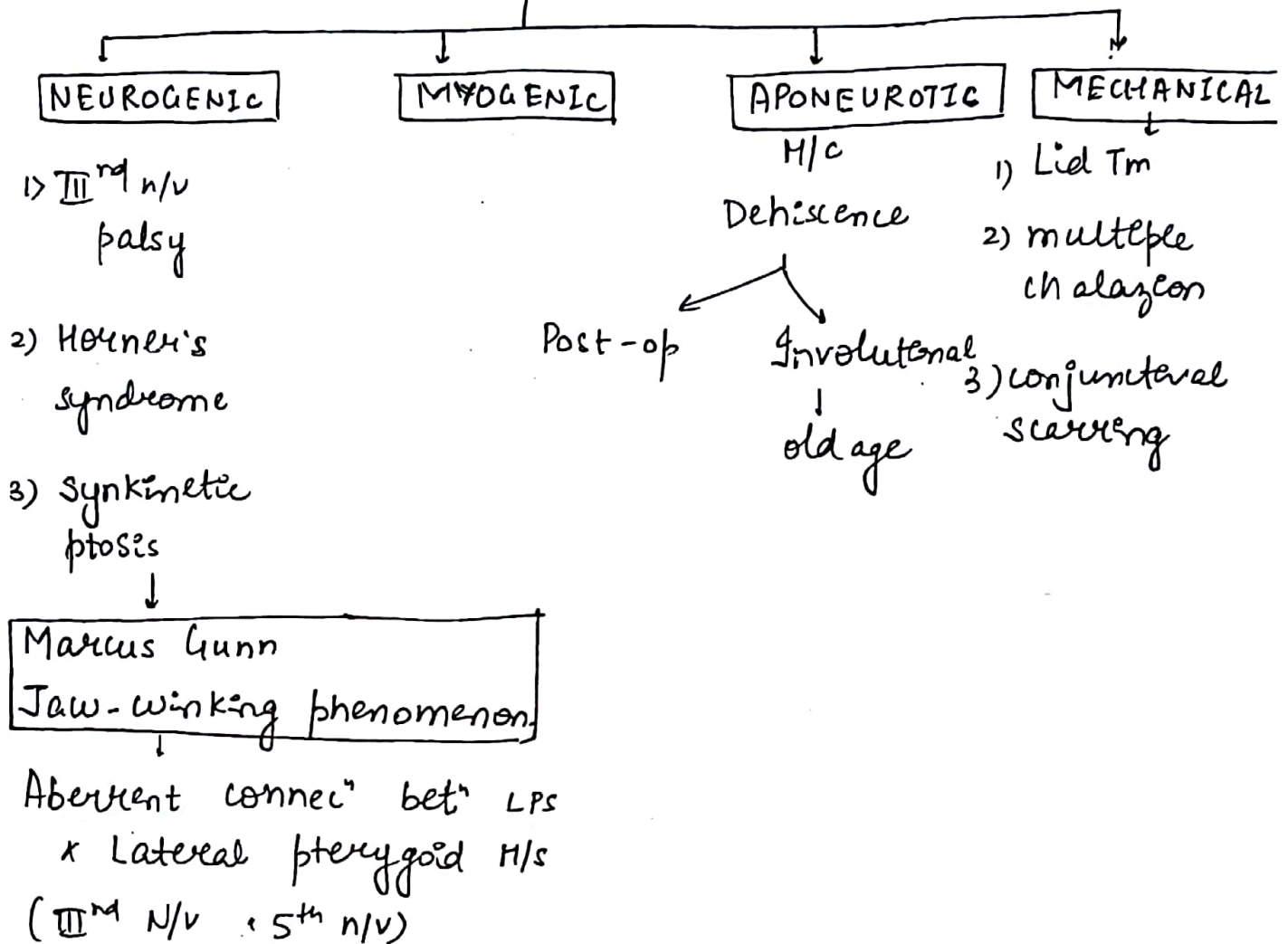
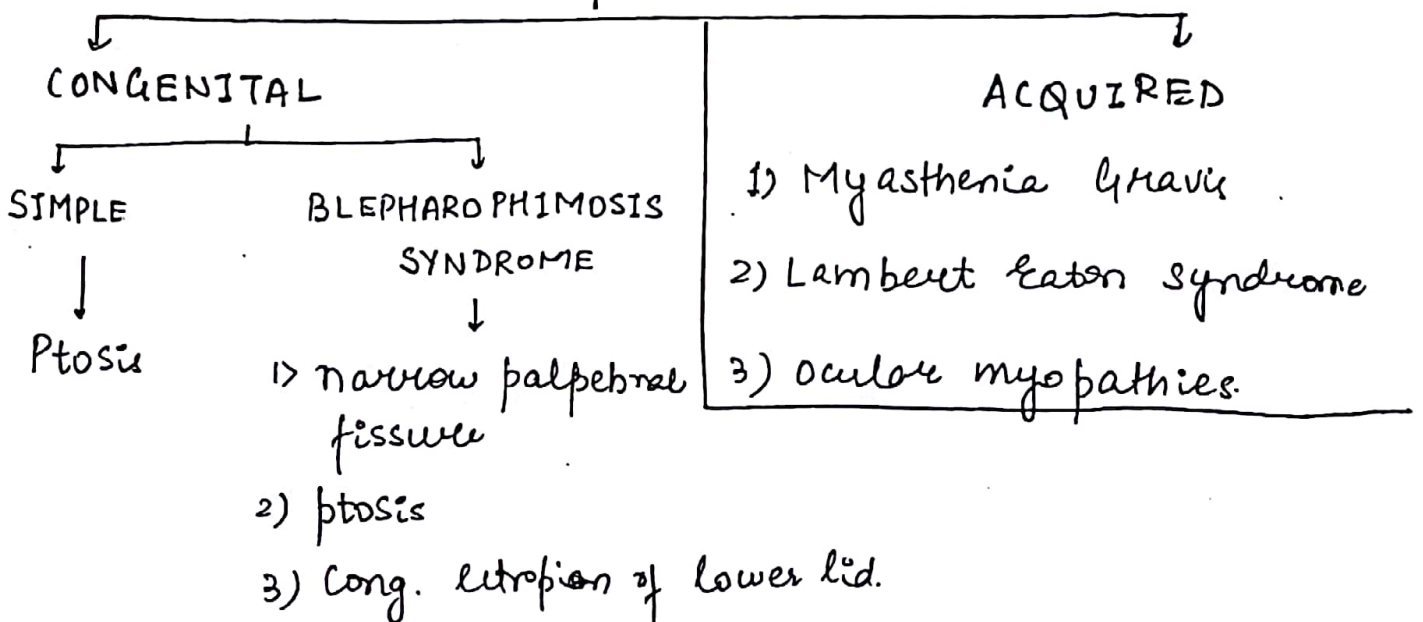
↓  
M/c site = upper lid.

Q. M/c malignant Tm of Lid = BASAL CELL CARCINOMA

↓  
M/c site = Lower Lid

↓  
Inner canthus

Drooping of lid.

TYPESMYOGENIC



4) Telecanthus (soft tissue  
IPD - (N))

173

5) Epicanthus inversus -

↳ extrafold of skin on medial.  
canthus is **Epicanthus**.

When arise from Lower Lid, it is  
called **Inversus**

Rx of Ptosis -

**LPS RESECTION**



Func<sup>n</sup> of LPS



Upper Lid Excursion (ULE)

**MULLERS  
RESECTION**

Fasanella-  
SERVAT  
Operation.

**SLING OPERATION**

Upper lid connected  
to frontalis m/s

Fascia Lata

↳ Ideal material

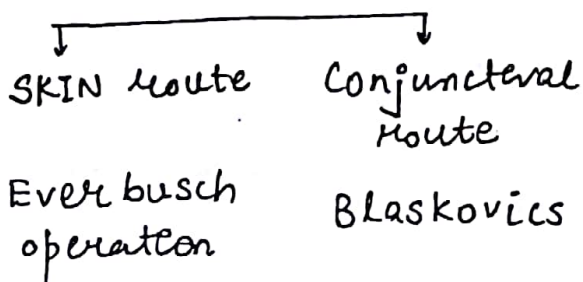
From Low

Distance from Lowermost  
to uppermost position of  
lid after blocking  
Frontalis m/s

**(N)  $\geq 12$  mm**

Min. req. for resection

↳ 4-5 mm



## PURKINJE IMAGES

Images formed on refracting surface of eye

(I)	(II)	(III)	(IV)
Ant. surface of cornea	Post. surface of cornea	Ant. surface of Lens	Post. surface of Lens

Q. Images absent in aphakia = (III) & (IV)

Q.  $\angle$  Image is Inverted = (IV)

Q. Pseudophakia  $\rightarrow$  all 4 Purkinje images are +ve

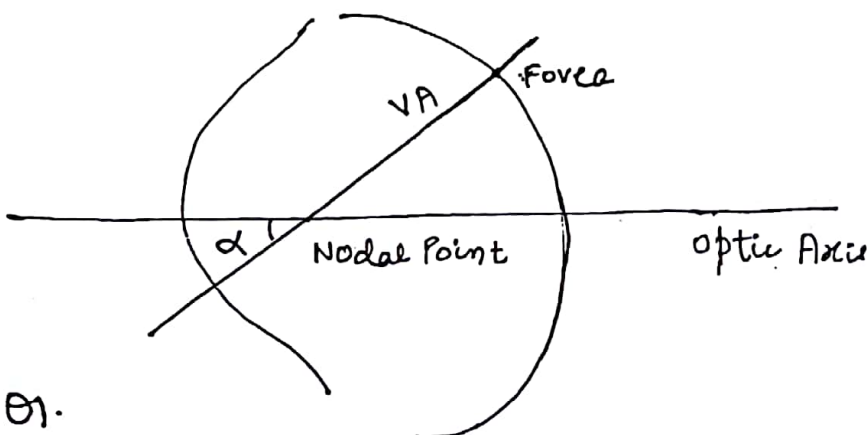
## VISUAL ANGLES

$\alpha$  angle

Optic axis + visual Axis at nodal Point

K angle

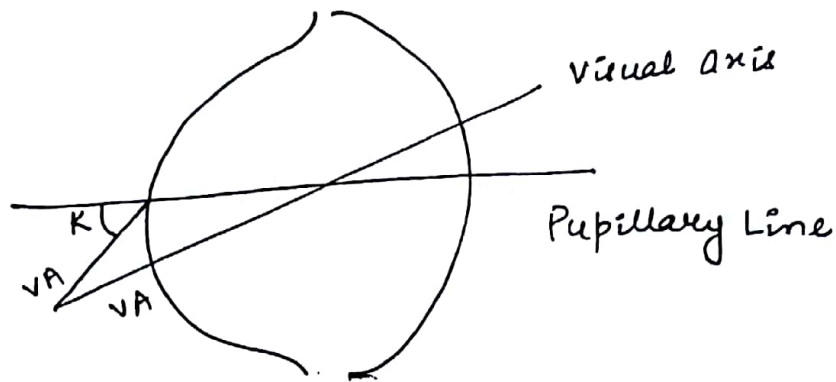
Pupillary Line + visual Axis at cornea



ASIMS Q1.

The angular spacing bet<sup>n</sup> bars of C or E in Snellen's chart is 1 min for 6/6 letter

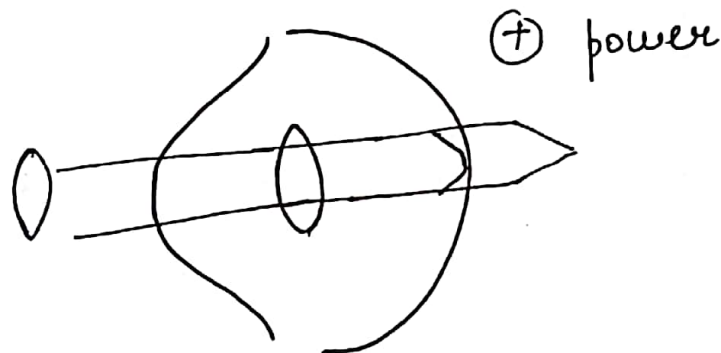
Largest letter when viewed from a distance of 6 meter, subtend an angle of 50 minutes in eye & bars of letter subtend 10 min



## REFRACTIVE ERRORS

### HYPERMETROPIA

- 1> Total Refractive Power is less than Required
- 2> Small eye
- 3> Light rays focussed behind Retina



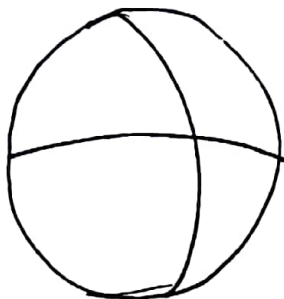
### MYOPIA

- 1> Total Refractive Power is more than Required
- 2> Large eyes
- 3> Light rays focussed in front



## ASTIGMATISM

Difference of refractive power between 2 principal axis



## ANISOMETROPIA

Difference of refractive power between 2 eyes of  $>2.5$  D.

## ANISEKONIA

Difference of Image size between 2 eyes  
5% is physiological + this helps us in depth perception.

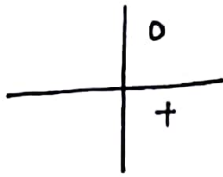
But anything more than that is anisekonia

It is measured by EIKONOMETRE

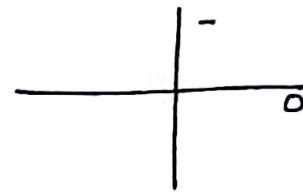
$R_x$  = ISEKONIC GLASSES

## CLASSIFICATION OF ASTIGMATISM

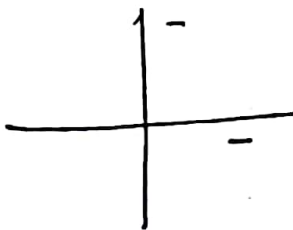
I>



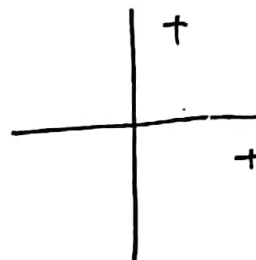
Simple HYPERMETROPIC



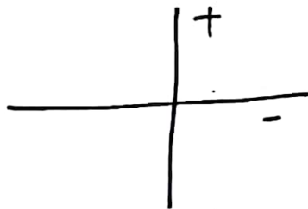
SIMPLE MYOPIC



COMPOUND MYOPIC

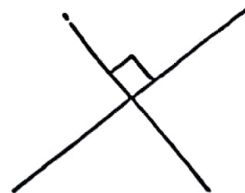
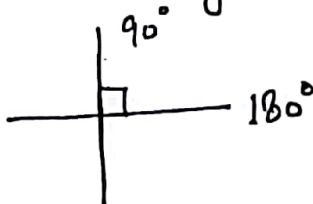


COMPOUND HYPERMETROPIC



MIXED ASTIGMATISM.

II> According to Axis



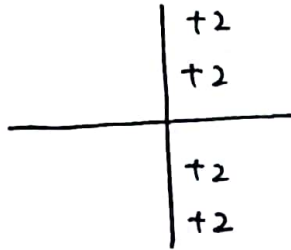
OBLIQUE  
ASTIGMATISM



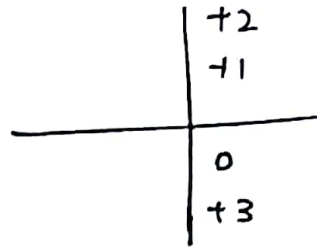
BIOBLIQUE  
ASTIGMATISM

III >

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REGULAR  
ASTIGMATISM

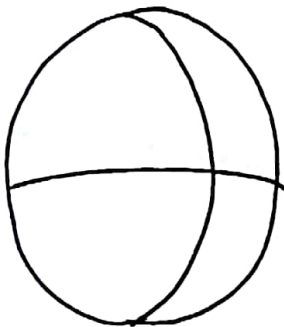


IRREGULAR  
ASTIGMATISM

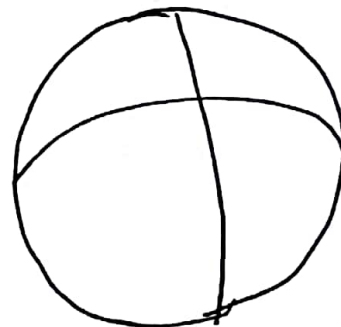
Keratoconus

IV > WITH THE RULE

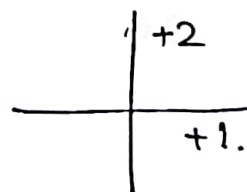
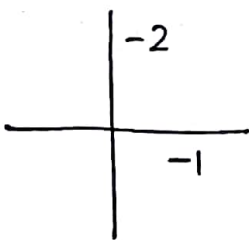
AGAINST THE RULE



vertical more curved



Horizontal more curved



- means eye is myopic

+ means eye is hypermetropic

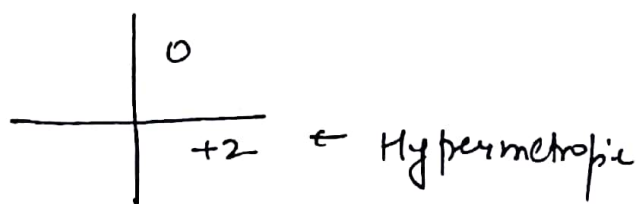
↓  
vertical more curved

↓  
vertical less curved

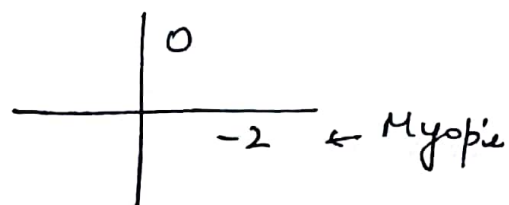
↓  
Hence  $\bar{\epsilon}$  the Rule

↓  
against the rule





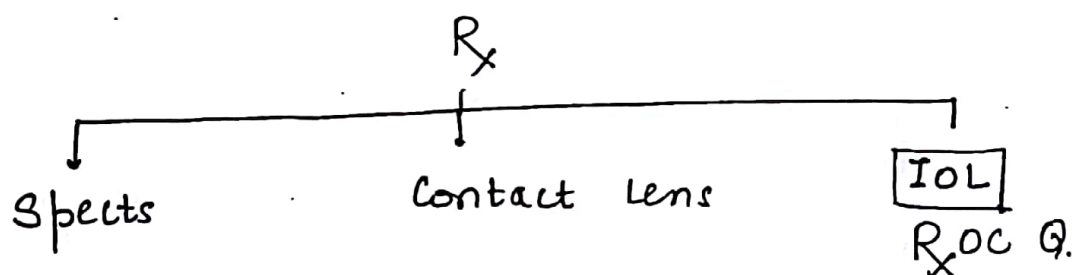
vertical move would  
↓  
O the Rule



vertical lens curved  
!  
against the Rule

APHAKIA

## HIGH HYPERMETROPIA.



Q. Choice of site of IOL implantation = Capsular Bag  
 > Post-chamber

Q only mydriatic & no cycloplegic action = Phenyl -  
ephedrine

Q. choice of cycloplegia in children = Atropine ointment (1%)

TDS x 3 days

check for atropine fever  
↳ stop the drug

SPECTS  $\rightarrow +10 \rightarrow +14 D$

### DISADVANTAGE -

1) Magnification  $\sim 30\%$

we can't correct unocular aphakes i.e. spectacles due to high aniseikonia leading to diplopia

2) High spherical aberration

spherical aberration means refraction from periphery is more than centres of lens.

↓

So, everything is PARABOLA

↓

PIN-CUSHION EFFECT

3) High Prismatic effect

It leads to RING-RING SCOTOMA

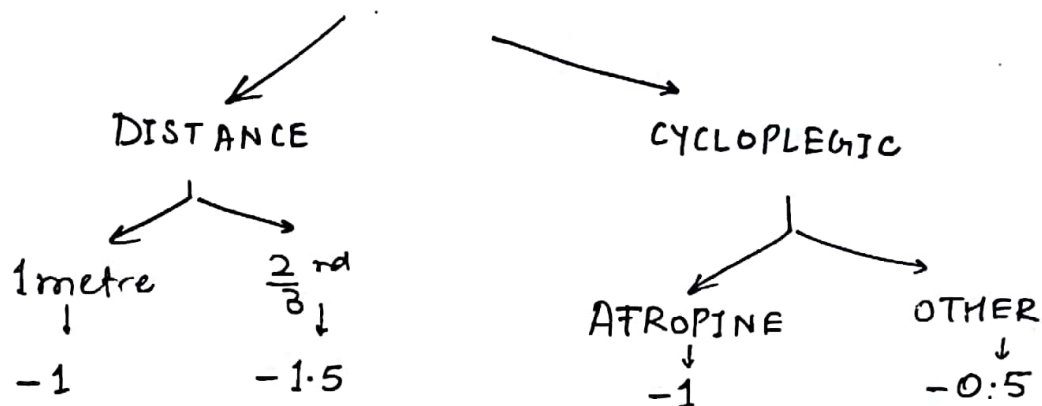
↓

Q. JACK IN BOX PHENOMENON

(things nearby go out of vision due to narrow field of vision)

## RETINOSCOPY

### CORRECTION FACTOR



Add correction factor to reading of retinoscopy

eg.

1/4

$$\begin{array}{|c|} \hline +3 \\ \hline +4 \\ \hline \end{array}$$

Dist.  $\frac{2}{3}$  rd, cycloplegic other than atropine

$$\begin{array}{|c|} \hline +3 \quad -2 \\ \hline +4 \quad -2 \\ \hline \end{array} = \begin{array}{|c|} \hline +1 \\ \hline +2 \\ \hline \end{array}$$

At 1m.

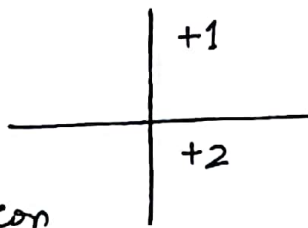
Movement Significance

With  $\rightarrow$  Hypermetropia/ Emmetropia/  $M < 1$

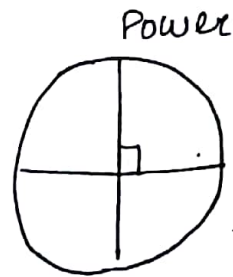
Against  $\rightarrow$  Myopia  $> 1$

No movement  $\rightarrow$  Myopia = 1

eg.



Prescription

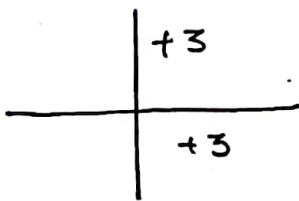


Axis  
 $\Rightarrow$  So, axis mentioned opp.

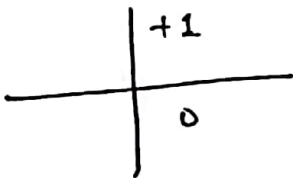
+1D spherical + 1D ~~cyl~~ cylinder at  $90^\circ$ .

+2D spherical - 1D cylinder at  $180^\circ$ .

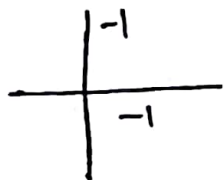
[spherical ~~gl~~ glasses give power to both axis.  
 So, by adding cylinder we neutralise power].



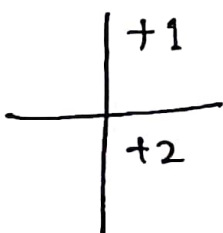
$\Rightarrow$  +3D spherical



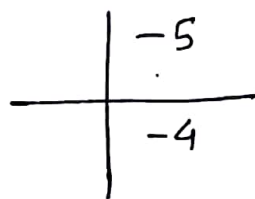
$\Rightarrow$  +1D ~~cyl~~ cylinder at  $180^\circ$   
 -1D ~~cyl~~ cylinder at  $90^\circ$



$\Rightarrow$  -1D spherical



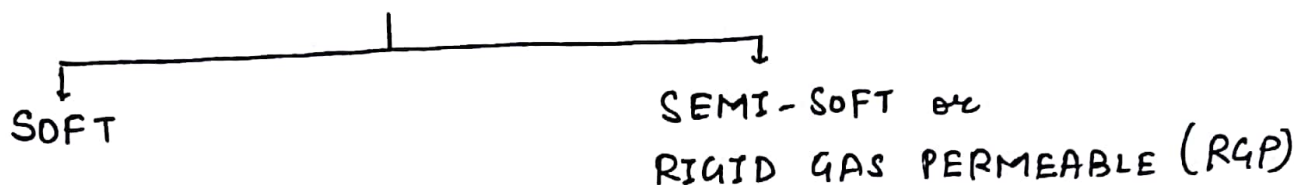
$\Rightarrow$  +1D spherical +1D cylinder at  $90^\circ$ .  
 +2D spherical -2D cylinder at  $180^\circ$ .



-4D spherical -1D cylinder at 180°

-5D spherical +1D cylinder at 90°

### CONTACT LENS



Q. Hydroxyethyl  
Methacrylate (HEMA)

1> silicone

2> Fluoro-silicone

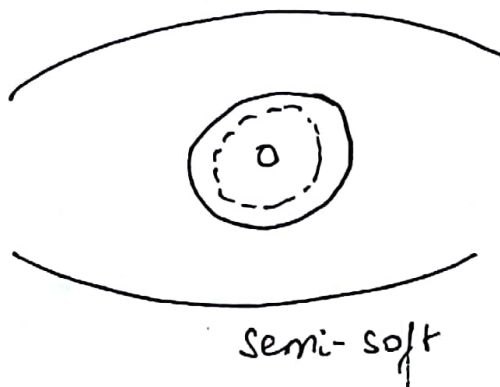
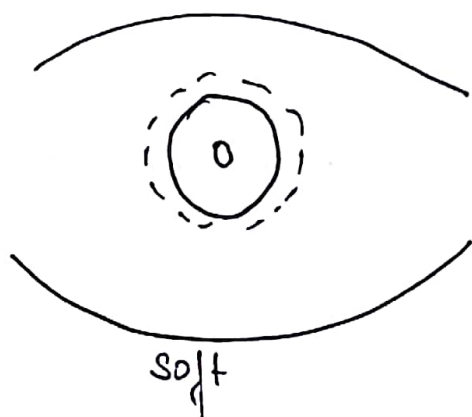
M/c infection after contact lens = *Pseudomonas*

Soft contact lens used are more prone to  
*Acanthamoeba Keratitis*

TORIC LENS - Contact lens = cylindrical correct  
for astigmatism



Q. CL type of CL lens used in keratoconus = RGP



Higher the water content  
Better is  $O_2$  transmissibility

## AMBLYOPIA

Partial Loss of vision  $\bar{=}$  no organic cause  
also called LAZY EYE.

Vision  $< 6/6$



PATHOLOGY Lies in LGB

C/F-

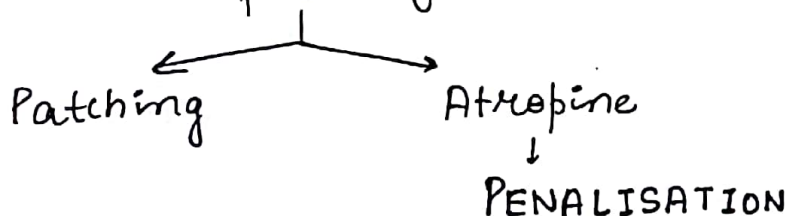
- 1) visual Acuity  $< 6/6$
- 2) ↓ed contrast sensitivity

Q 3) Sunglass effect -  
Brightness is less in effected eye

Q 4) Crowding phenomenon  
skipping of nearby letters  
A B CD  
= =

RxOC - QA

1) Occlusion of (N) eye (4-6 hours/day)





## BINOCULAR SINGLE VISION / FUNCTION<sup>185</sup>

Difficulty of Brain to fuse 2 Retinal Images as 1

Q. Foveal Reflex formation = 5-6 months

Q BSV = 5-6 years.

Q. GRADES OF BSV

(I)

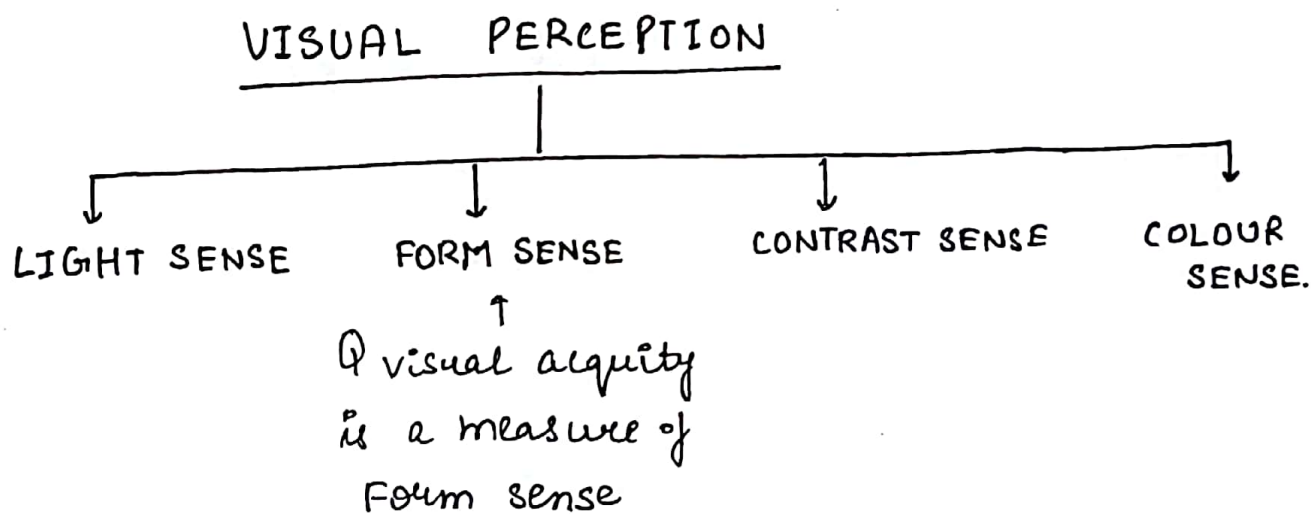
Simultaneous  
Perception

(II)

Fusion

(III)

Stereopsis  
[DEPTH perception]



### DIPLOPIA (Q)

Double Vision.

(I) HORIZONTAL / VERTICAL / TORSIONAL

(II) UNIOcular / BINOCULAR

M/cc  
↓  
Subluxation  
of Lens

M/cc  
↓  
Paralytic squint

## UNILOCULAR

### CAUSES

1) Incipient / Intumescent cataract

2) Polyuria

3)

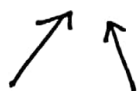
III

CROSSED & UNCROSSED

UNCROSSED

False Image toward  
squinted eye

seen in convergent  
squint / Esotropia



Lateral Rectus Palsy  
↓  
convergent squint

## BINOCLULAR

### CAUSE

1) Thyroid ophthalmopathy

2) Blow out #

~~UNCROSSED~~ CROSSED

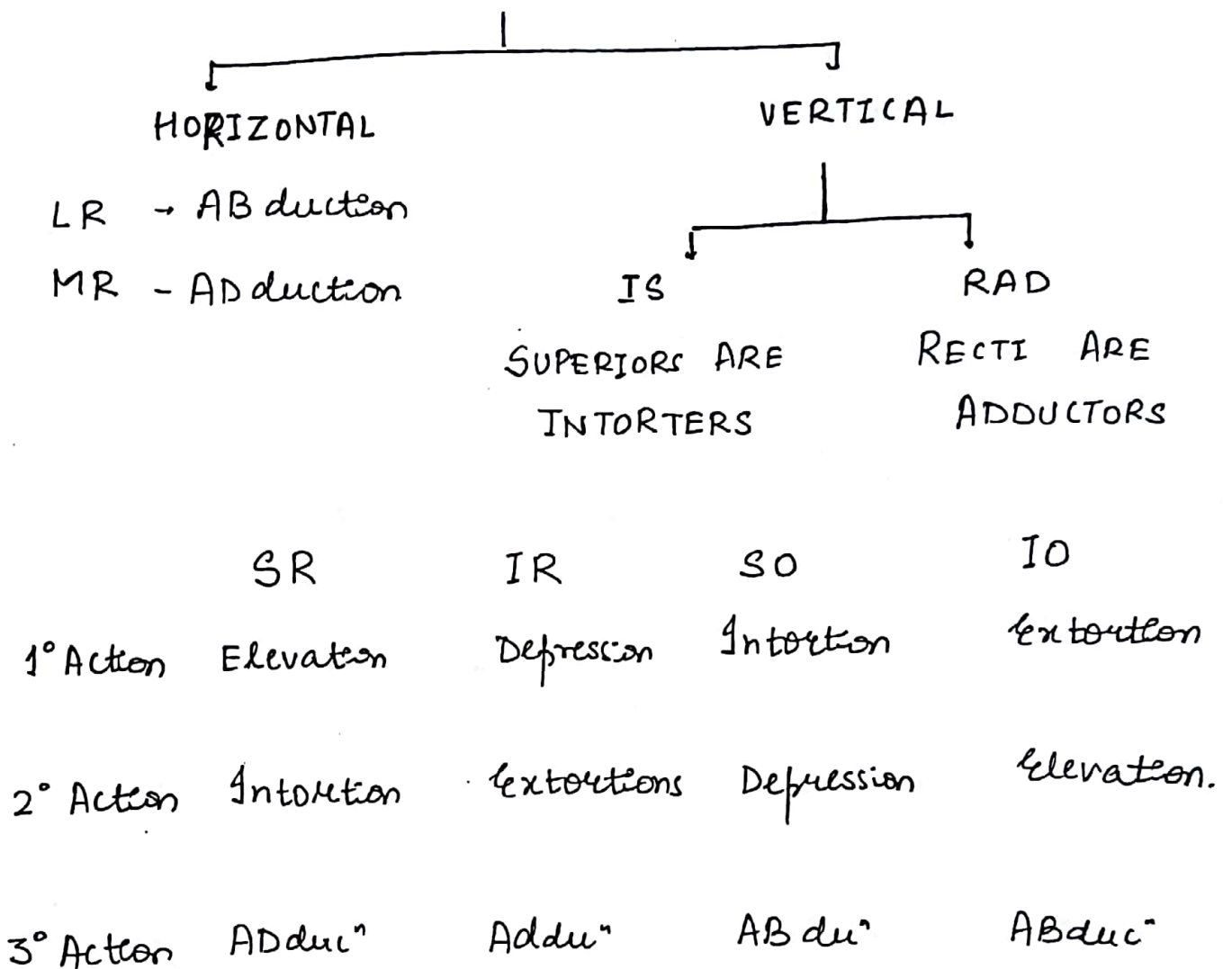
False Image opposite  
squinted eye

Seen in Divergent squint/  
Exotropia



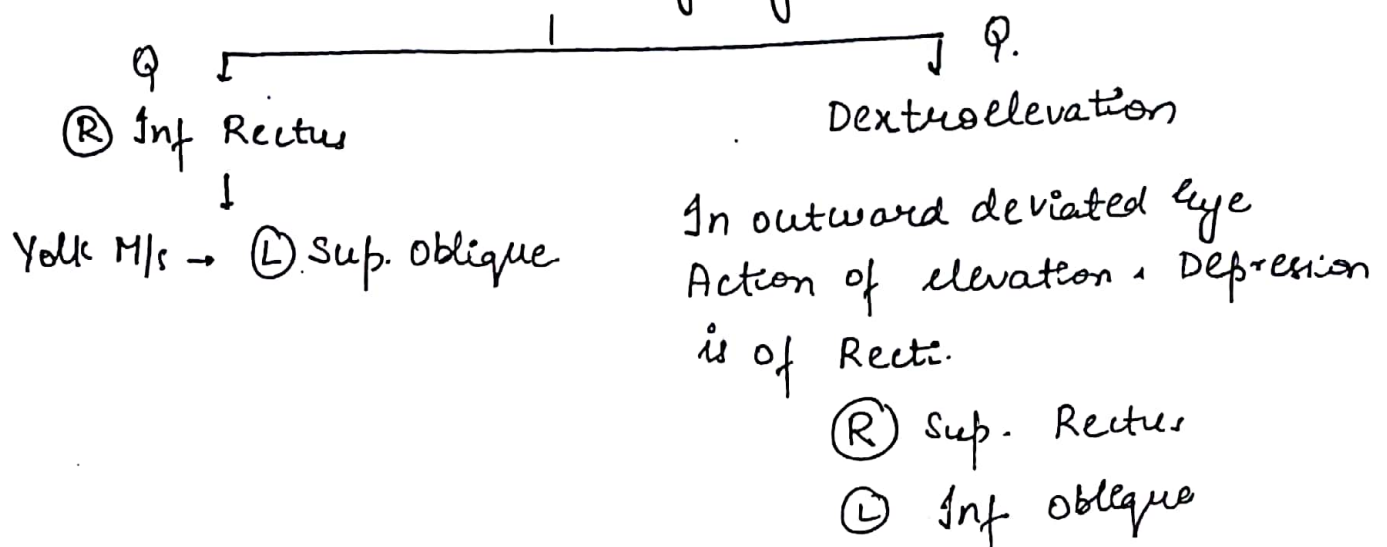
# ACTION OF MUSCLES

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## YOLK M/S

Contralateral Synergists



Levo depression -

- Ⓐ Inf Rectus
- Ⓑ Sup oblique

### HERINGS LAW

There is equal innervation in yolk M/s

### SHERINGTONS LAW

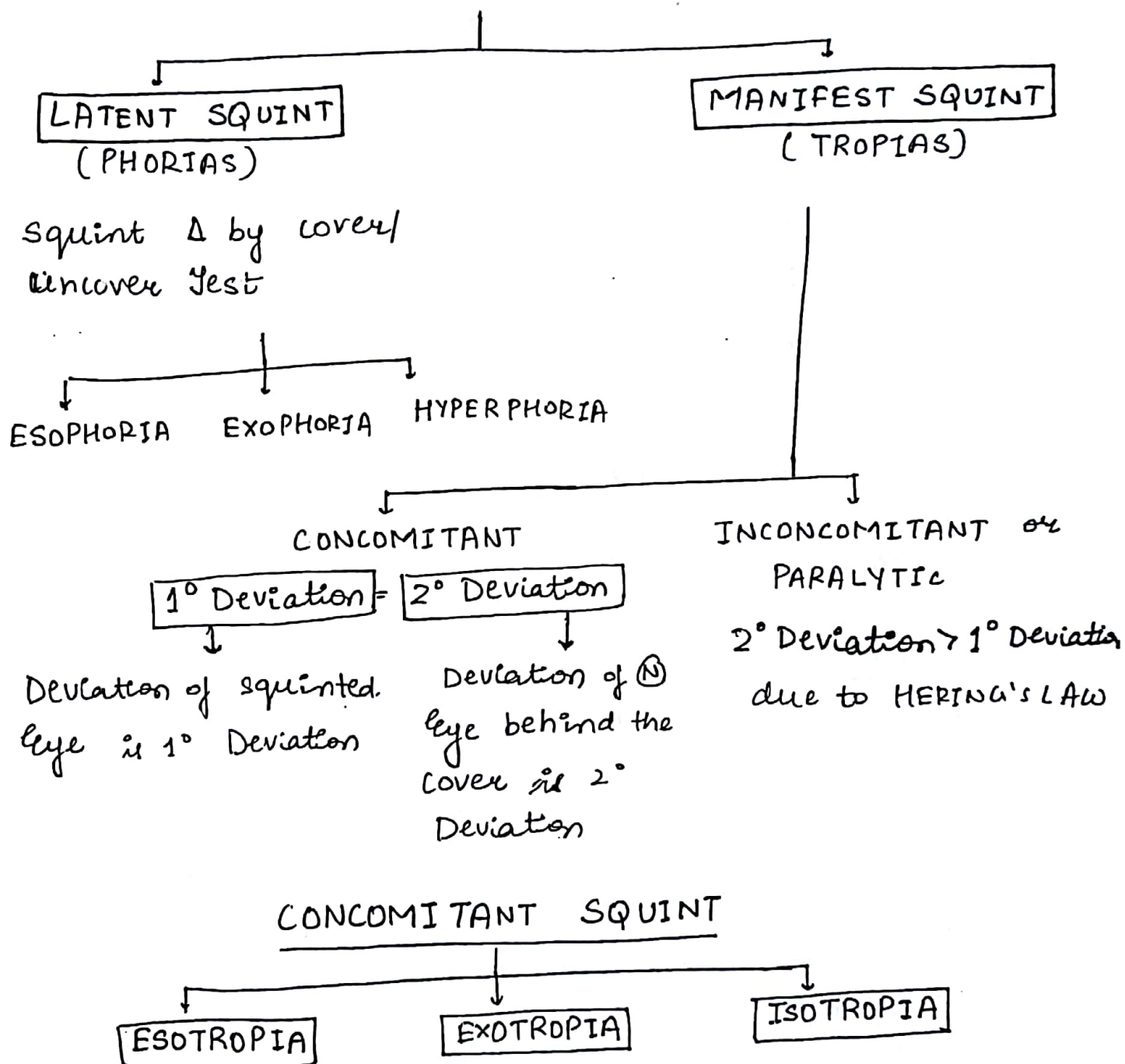
equal / Reciprocal innervation in agonist + antagonist M/s



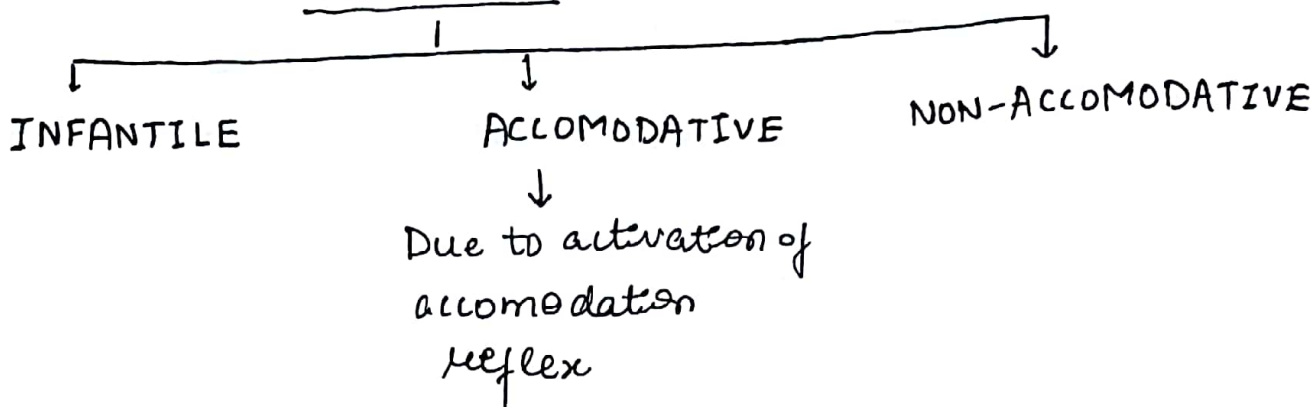
same. equal +  
Reciprocal

# STRABISMUS

Misalignment of eyeball.



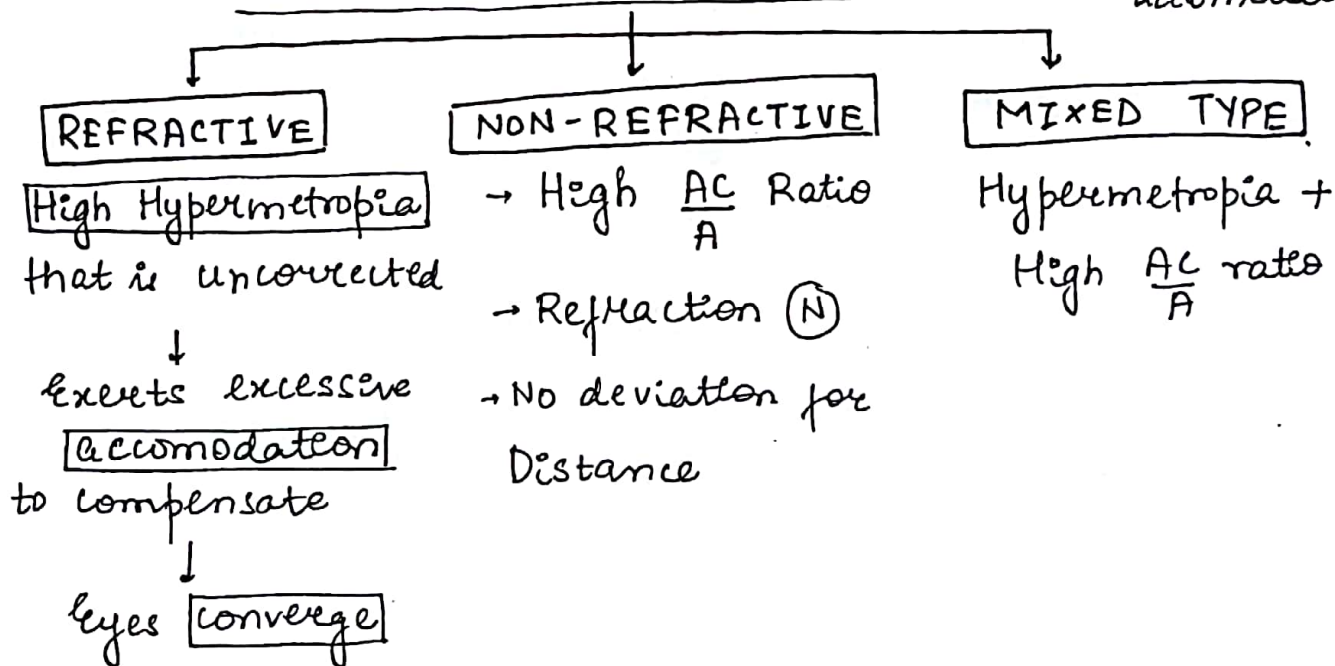
# ESOTRIA



## INFANTILE ESOTROPIA

- 1) Manifests in 6 months
- 2) Angle of deviation is Large ~ 30 prism Diopters
- 3) Latent Nystagmus manifested by cover ~~uncover~~ test
- 4) Refractive error is (N) for age

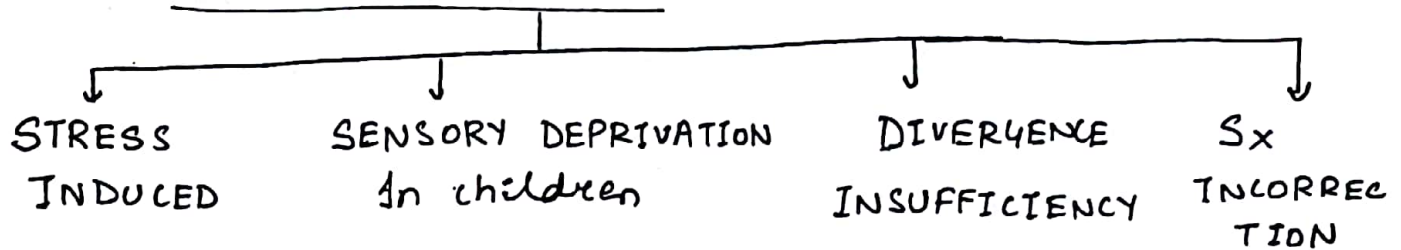
## ACCOMODATIVE ESOTROPIA [Due to stimulation of accommodation]



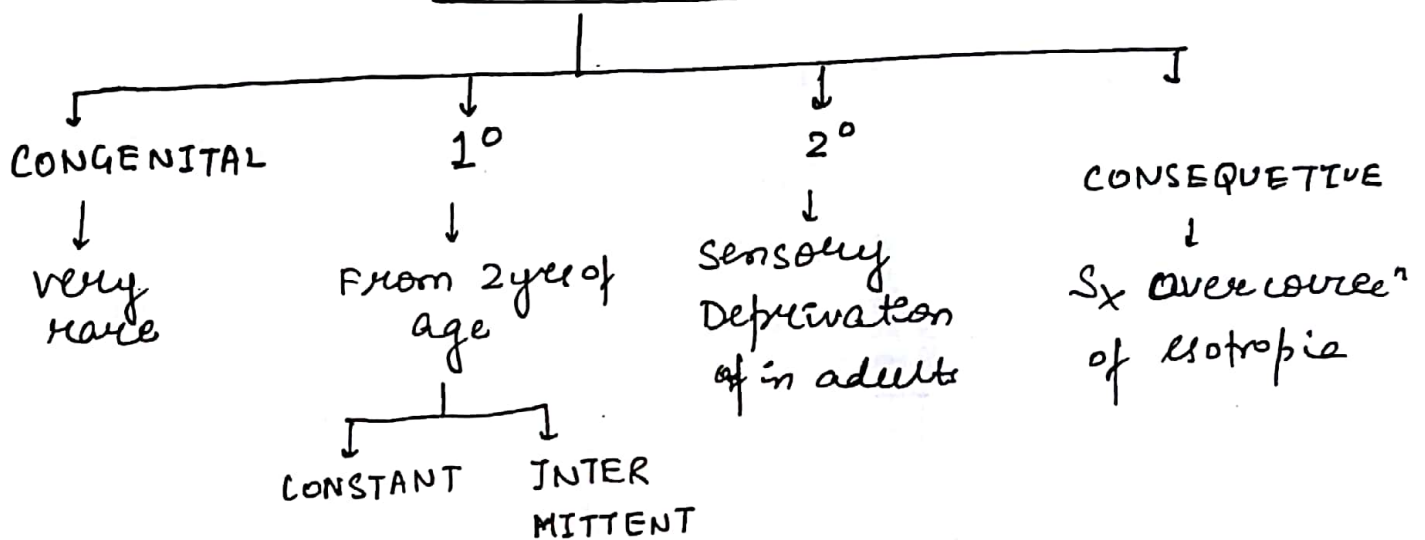
(N)  $\frac{AC}{A}$



## NON - ACCOMODATIVE



## EXOTROPIA



## PARALYTIC SQUINT

- 1> Diplopia
- 2> Confusion
- 3> Deviation  
 $2^\circ > 1^\circ$  [due to Hering's Law]
- 4> Restricted ocular movement
- 5> Compensatory head Posture.

## IV<sup>th</sup> N/V Palsy [Sup. oblique Paralyzed]

### FEATURES -

- 1) Hypertropia
- 2) Exocycloversion
- 3) Vertical Diplopia worst on looking Down.
- 4) Limited depression in adduc<sup>n</sup>
- 5) Compensatory Head Posture → Head tilt on opposite side Q.

### BIELCHOWSKY'S SIGN Q

↳ Left Hypertropia

↓  
Tilt the head toward (L) shoulder

↓  
To Look straight eye has to intort

↓  
Superior eye intorters

↓  
If S.O. Palsy,

there is overworking of SR

↓  
↑ in Hypertropia

Hence, so Palsy confirmed.

## VI<sup>th</sup> N/V PALSY [LR-6]

193

- 1> convergent esotropia
- 2> Defective ABduc<sup>n</sup> of affected side
- 3> ⓐ Horizontal Diplopia - worst in affected side
- 4> Face turned towards Paralytic side.

### MANAGEMENT OF SQUINT

#### 1> HIRSCHBERG TEST :-

1mm of Deviation of Light reflex =  $7^\circ$   
↓  
15 DD

Pupillary Border =  $18^\circ - 20^\circ$

At Limbus =  $45^\circ$

#### 2> KRIMSKY'S TEST/ PRISM BAR TEST-

Measure exact amount of squint in prism diopter

#### 3> COVER - UNCOVER TEST

#### 4> ALTERNATE COVER TEST



Prism Bar

### PARALYTIC SQUINT

↳ wait for 5-6 months to improve

↓ If doesn't improve

Squint Sx

Underacting	→	Resection.
Overacting	→	Recession

## CONCOMITANT SQUINT-

I> Refraction

↓

II> Check for amblyopia  
Occlusion (if needed)

↓

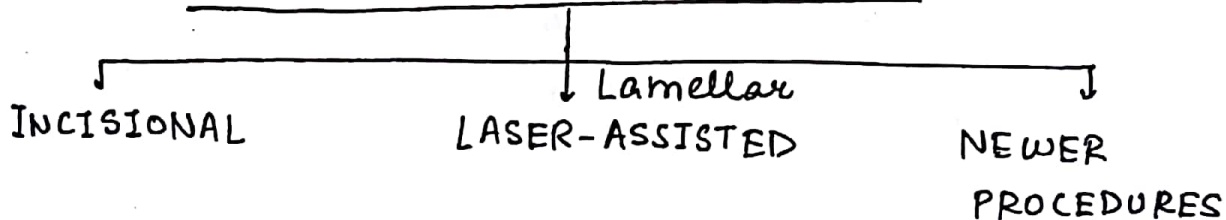
Orthoptic exercises (if needed)

[Strengthening the convergence]

↓ - if nothing works

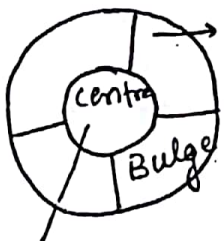
Squint Sx

## REFRACTIVE SURGERIES



### INCISIONAL

I> RADIAL KERATOTOMY



Radial cuts @  $\approx$  diamond at Periphery

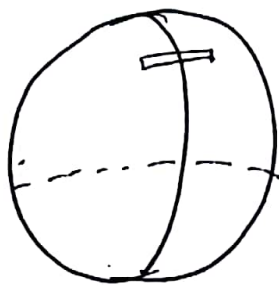
Myopic  $\rightarrow$  Best results are  $\approx 5D$   
 $\approx 1m$

Centre flattening is to be done

## 27 ARCUATE KERATOTOMY / T-CUTS

195

used to Rx astigmatism

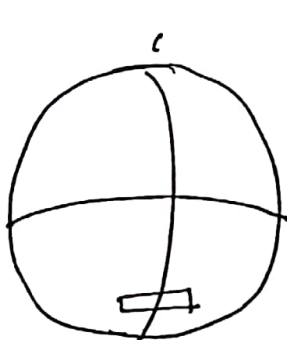


↓ cut on steeper axis

↓  
that axis flattens on 'healing'

↓  
compensatory curving on opposite axis

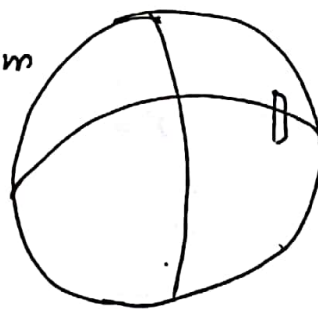
↓  
Rx astigmatism by "COUPLING EFFECT"



↓

↓ the rule

↓ cataract  
astigmatism



Temporarily

against the rule

## LAMELLAR / LASER ASSISTED

KERATOMILEUSIS - changing corneal curvature

Laser used is EXCIMER

Arg

Argon F

$\lambda = 193 \text{ nm}$

### PRE-REQUISITES :-

- 1> Pachymetry reading (N)
- 2> Age > 18yrs
- 3> Stable refractive error since last 6 months
- 4> Ant. Seg (N)
- 5> Fundus (N)



- 1) Refraction
- 2) Pachymetry
- 3) Corneal Topography

## 1) PRK [PHOTO REFRACTIVE KERATECTOMY]

Remove the epithelium (painful)

↓  
Apply Laser [dealing w superficial stroma]

↓  
Bandage

DISADVANTAGE

Painful

Long Rehabilitation Time

## 2) LASIK [LASER IN SITU KERATOMILEUSIS]

Raise a flap → by microkeratome

↳ by Femto laser

↓  
Apply LASER [Deeper stroma]

↓  
Put the flap back

## 3) EPI-LASIK / LASEK [Laser sub-epithelial Keratomileusis]

Raising epithelial flap

↓  
Apply Laser [Sup. stroma]

↓  
Put the flap back

} Done for Nebular opacity



S/E-

- 1) Dry Eye
- 2) Regression of No.
- 3) Sand of Sahara Syndrome
  - ↳ infiltration of inflammatory cells b/w bed & flap.
- 4) Epithelial Ingrowth Bet<sup>n</sup> Bed & Flap
- 5) Infer<sup>n</sup> bet<sup>n</sup> Bed & flap
- 6) Fibrous ingrowth Bet<sup>n</sup> Bed & Flap.

### NEWER PROCEDURE

- 1) SMILE Procedure → Femtolaser.

[Small Incision Lenticule Extraction]

Procedure - Focus Femtolaser on stroma

↓  
cut the lenticule

↓  
Remove the lenticule through a Small Incision

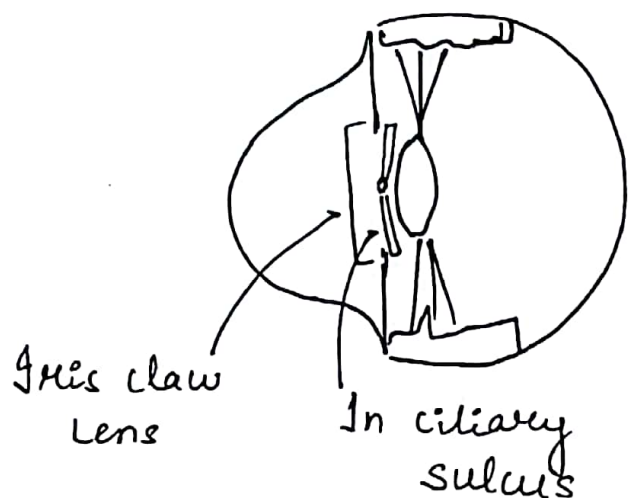
- 2) CLEAR LENS EXTRACTION-



Non-cataractous  
To Rx → High Myopia

Retinal Detachment may occur if post capsule

### 37 PHAKIC IOL IMPLANTATION-



Cataract may develop if IOL touches Lens.

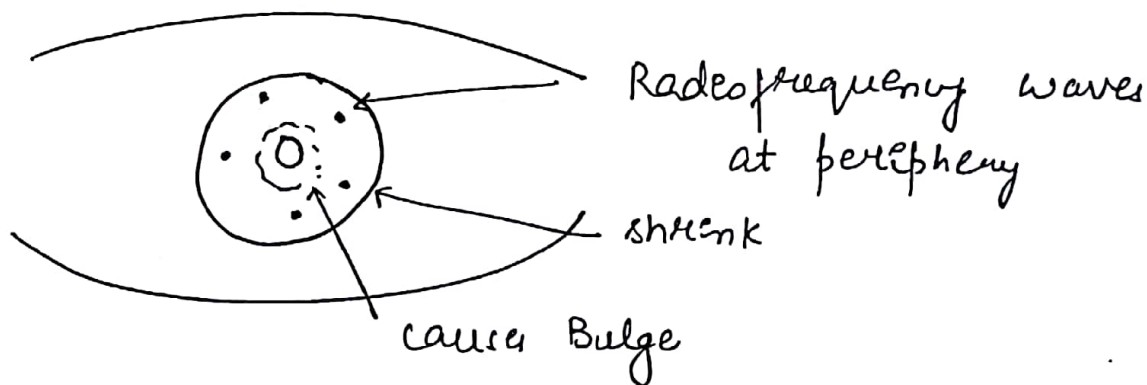
### 47 CONDUCTIVE KERATOPLASTY

Done in Presbyopia.

Ideal Pt-

↳ Emmetropic (N)

2-2.5 D



Based on Monocular Vision

So, untreated eye used for Far

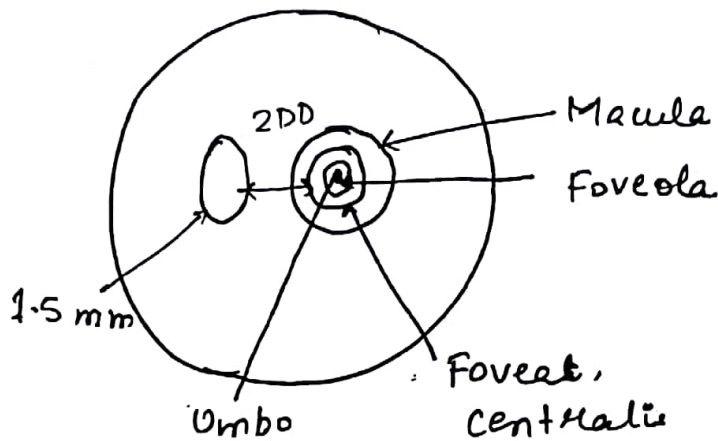
treated eye used for near

# RETINA

199

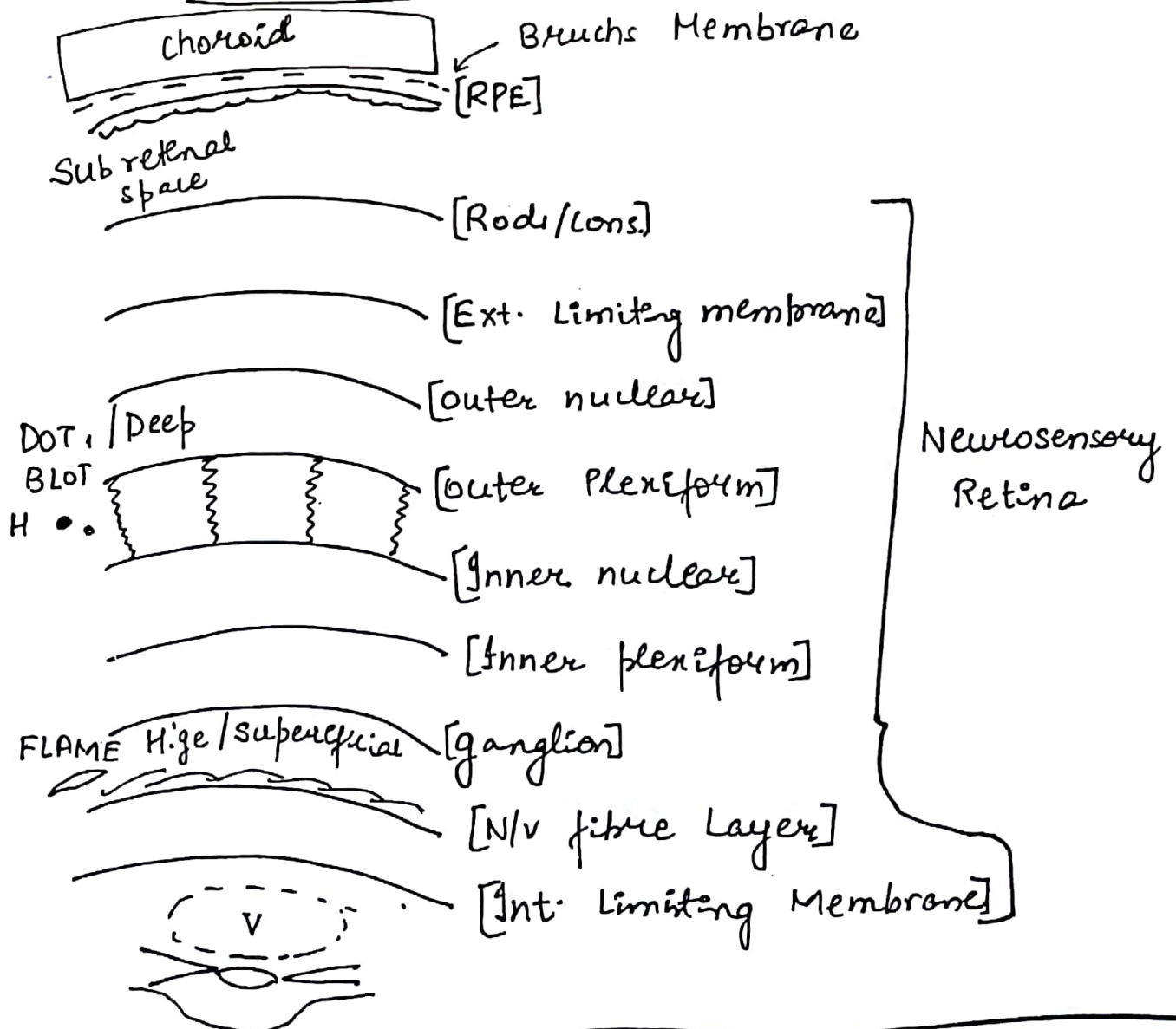
Most SENSITIVE → FOVEOLA

THINNEST → ORRA SERRATA (0.1mm)



AMBLYSCOPE /  
SYNAPTAPHORE  
↳ Image.

## LAYERS OF RETINA



HARD EXUDATES

↓  
[Lipids]

SOFT EXUDATES

↓  
[Axonal Debris]

\* SEQUENCE OF EVENTS IN RETINA [RETINITIS PROLIFERANS]

HYPOXIA



↑ sed capillary Permeability

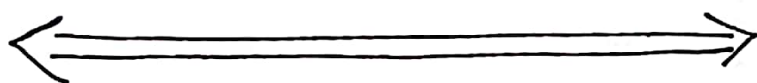


Leakage



Edema

Exudates

H<sub>2</sub>O

↑↑↑ HYPOXIA



Release of chemotactic factors



Neovascularisation

NVD - at Disc  
NVE - anywhere else

Vitreous  
H<sub>2</sub>OTractional  
RDNeovascular  
Glaucoma

\* ROLE OF PAN RETINAL PHOTOCOAGULATION —  
Convert Hypoxia to Anoxia

## CHEMOTACTIC FACTORS

201

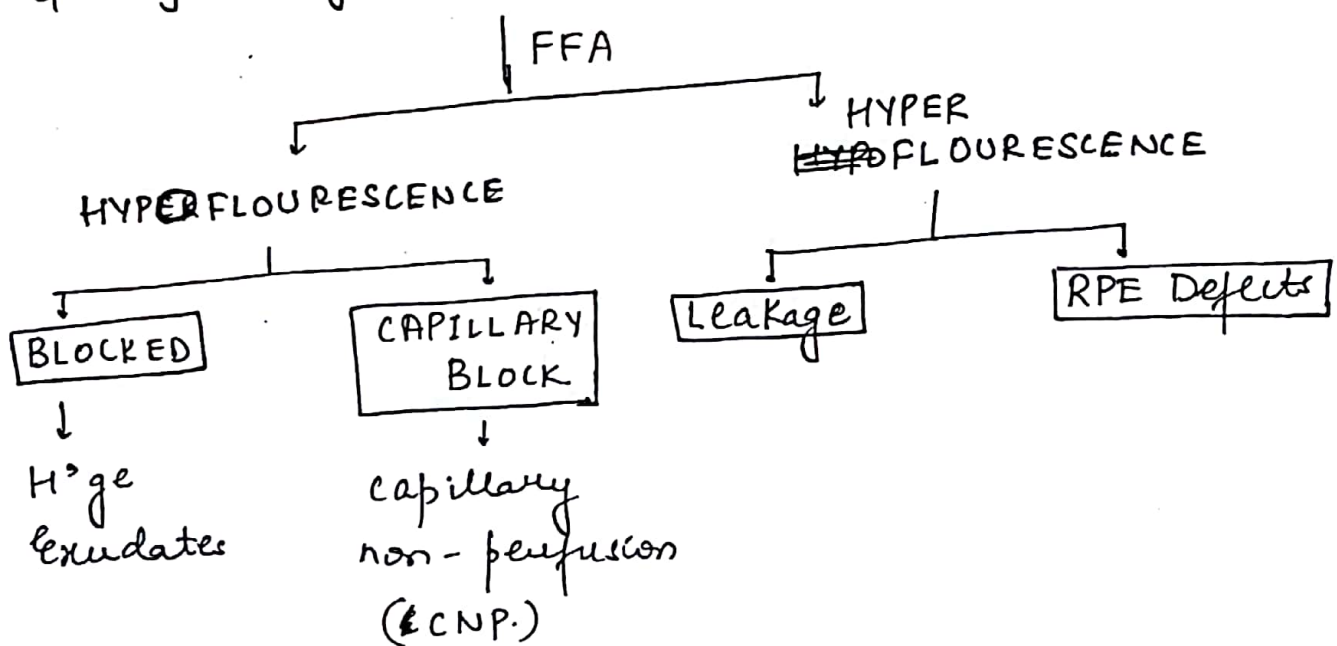
- 1) VEGF (VASCULAR ENDOTHELIAL GROWTH FACTOR)
- 2) PDGF (PLATELET DERIVED " " )
- 3) ILF (INSULIN LIKE " " )
- 4) bFGF (basic FIBROBLAST " " )
- 5) TNF- $\alpha$  (TUMOUR NECROSIS FACTOR)
- 6) TGF  $\alpha/\beta$  (TRANSFORMING GROWTH FACTOR)

Q. IL. + Interferons are not related to angiogenesis  $\rightarrow$  They are related to Inflammation

## INVESTIGATION

### 1) FUNDUS FLOURESCENCE ANGIOGRAPHY (FFA)

Q. Inject dye in Antecubital vein





## Q. ICG ANGIOGRAPHY

[Indocyanine Green] → 98% bound to Plasma Protein.

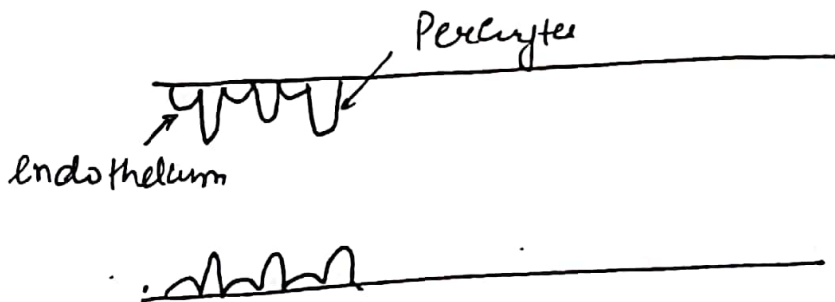
Specially used to study CHOROID. stays for longer time

Q. ICG → particularly used for occult choroidal neovascularisation

## DIABETIC RETINOPATHY

Pathogenesis — Retinitis Proliferans.

PATHOLOGICAL CHANGES AT CAPILLARY —



1> Loss of Pericytes Q.

C/F-

### STAGES

1①

BACKGROUND (BDR)

PRE-PROLIFERATIVE

PROLIFERATIVE

1> Earliest feature

~~BDR~~ +

↳ Micro-aneurysm

↓  
Inner nuclear Layer

2> H<sup>2</sup>ge, oedema, exudate



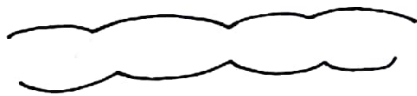
## PRE - PROLIFERATIVE

203

BDR

+

- 1> ↑↑↑ Cotton - Wool spots
- 2> Large Blot H'ge [venous Infarcts]
- 3> Looping + Beading of capillary



4> IRMA (Intra-Retinal Microvascular Ab(N))

↓  
capillary shunt vessels

## PROLIFERATIVE

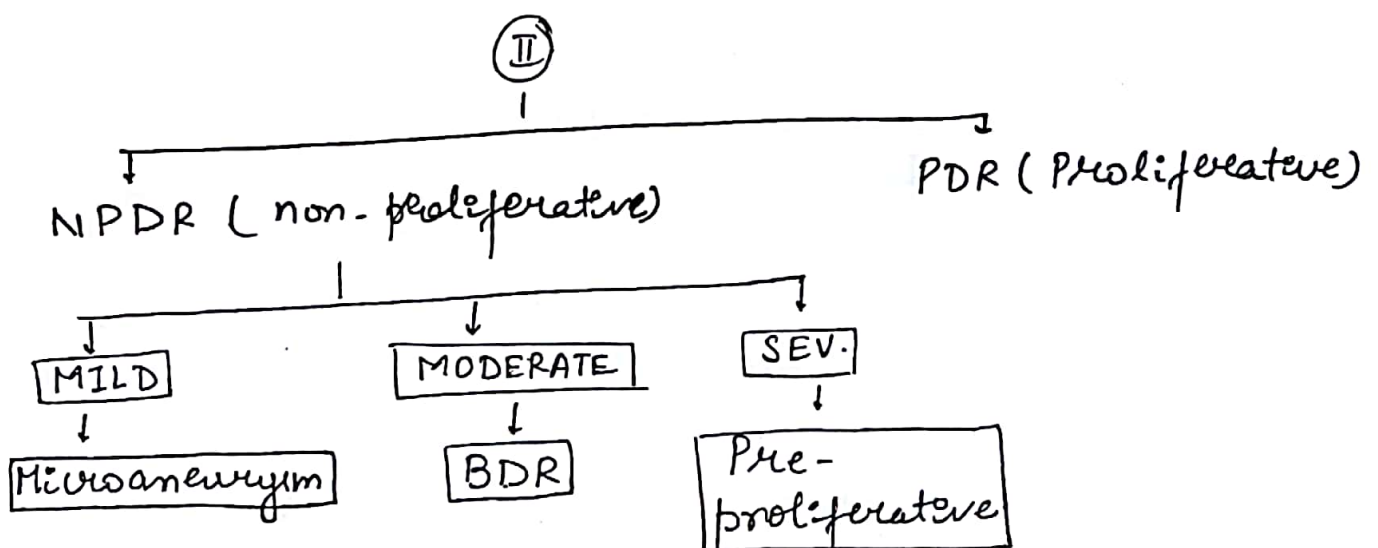
Pre-proliferative

+

Neovascularisation

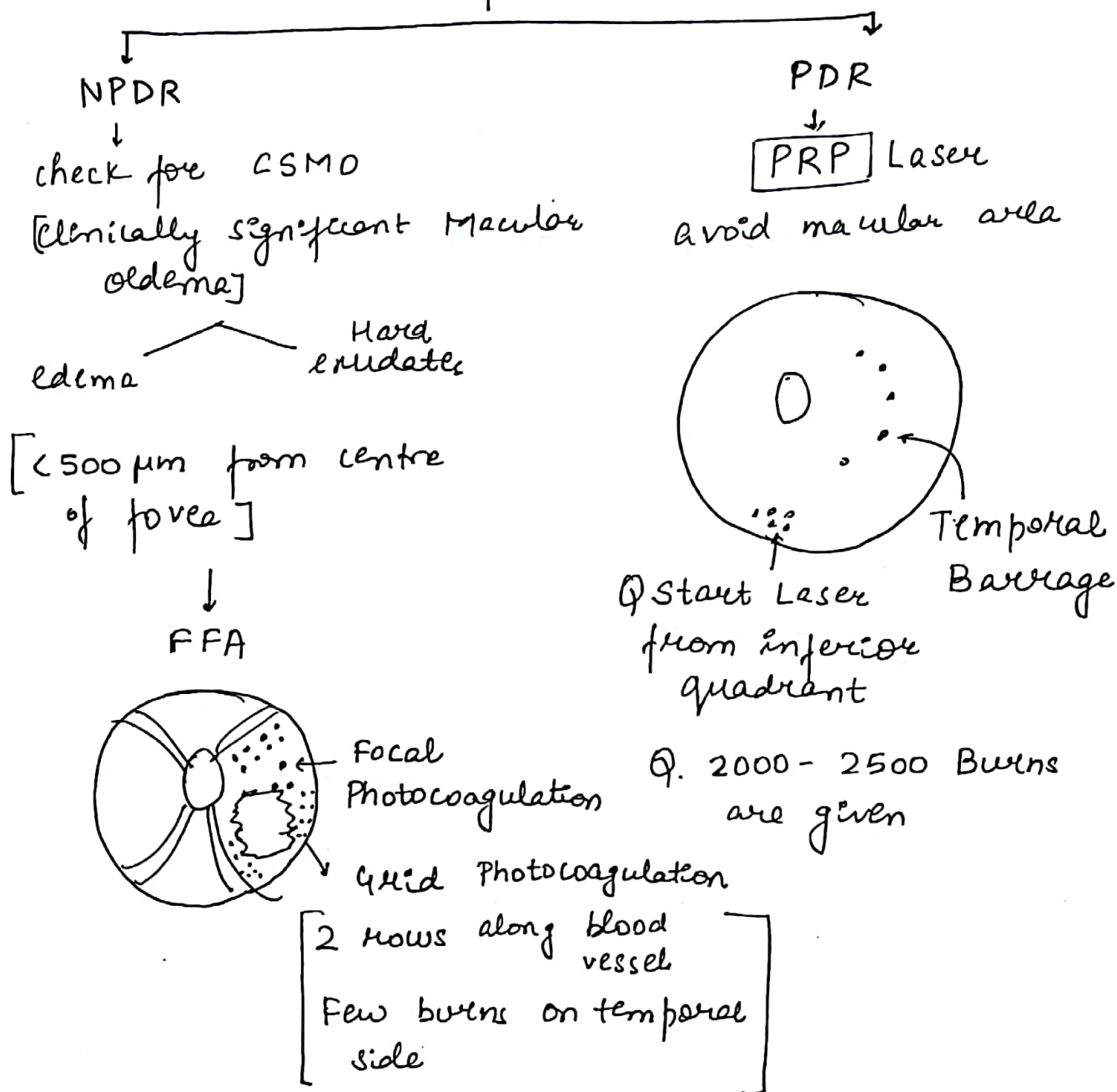
WVD

NVE



Rx- 1) Glycemic Control

2)



Q. Most Imp factor for occurrence of Retinopathy in a diabetic patient-  $\Rightarrow$  DURATION (25-30 yrs)

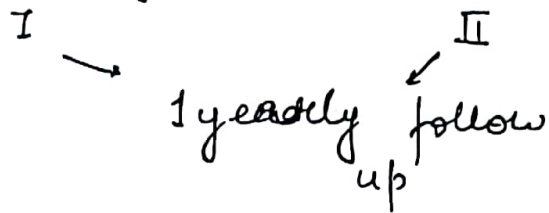
Q. 2nd most Imp. factor  $\Rightarrow$  GLYCEMIC CONTROL.

Q. 1st Fundus exam when?

Type I  $\rightarrow$  After 5 years

Type II  $\rightarrow$  Immediately

Q. Frequency of follow-up



Q Frequency of follow-up in ♀

↓  
3 monthly follow up

$$\textcircled{N} \frac{\text{Artery}}{\text{vein}} = \frac{2}{3}$$

### HTN RETINOPATHY

changes in retina due to long standing HTN

#### KEITH-WAGNER GRADING

- ① Generalised attenuation of artery
- ② ① + Focal spasm
- ③ ② + H<sup>2</sup>ge + exudates
- ④ ③ + Papilloedema

Q. Pt of PIH presents = Hypertensive Retinopathy  
(♀ Induced HTN)

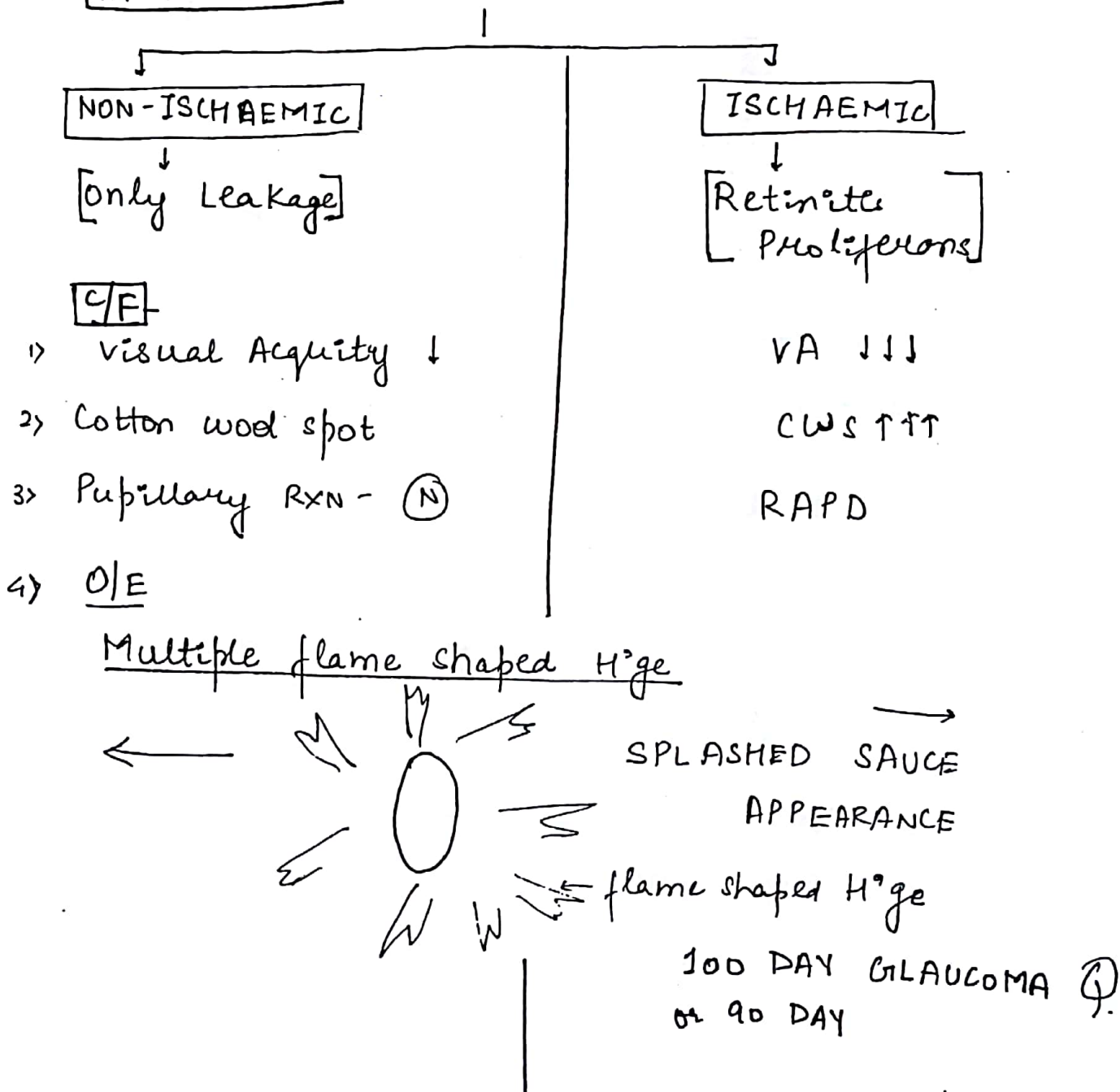
# CENTRAL RETINAL VEIN OCCLUSION (CRVO)<sup>206</sup>

## RISK FACTORS-

- 1) HTN
- 2) Small eye (Hypermetropia)  
↳ Small Lamina Cribrosa
- 3) ↑ IOP
- 4) Blood viscosity Syndrome → Polycythemia/Leukemia

57

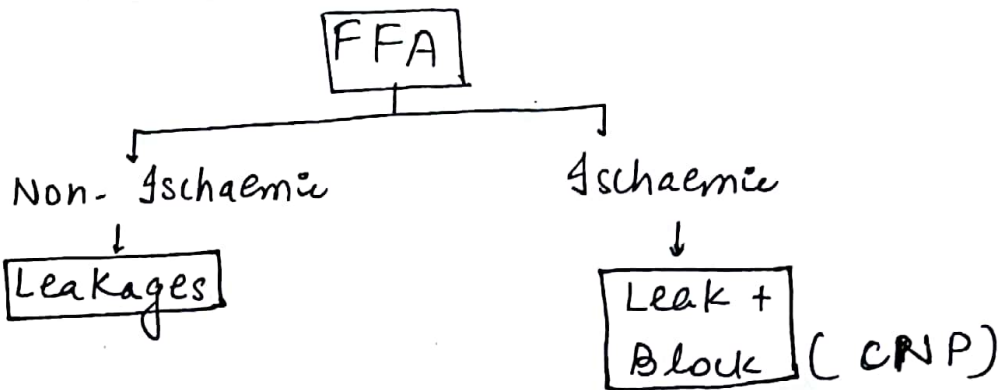
## PATHOGENESIS-



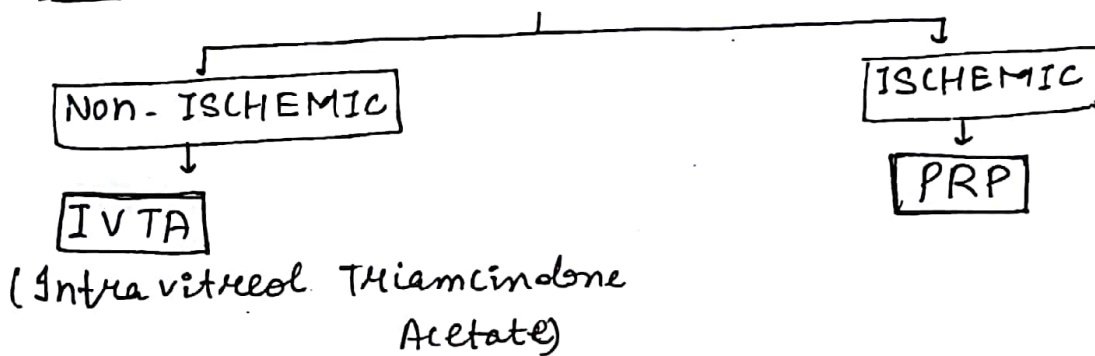
## INVESTIGATION-

207

1>



Rx-



Monitor IOP

## CENTRAL RETINAL ARTERY OCCLUSION (CRAO)

↳ embolism occurs. ATIMS Q&A

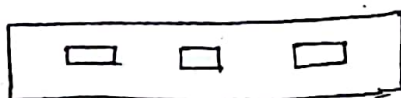
### \* RISK FACTOR-

- A> 1) Heart Disease
- 2) Carotid artery Disease
- B> Mucormycosis Q

Cherry Red Spot + Hollenhorst plaque are seen in Both CRAO & BRAO.  
But CRAO > BRAO.

### \* C/F-

- 1) Sudden painless loss of vision
- 2) Severe oedema → white retina
- 3) Marked attenuation of artery → thread like arteries
- 4) Interrupted blood column in brain



Cattle Track appearance of blood flow (VEINS)



5) Cherry red spot

### D/D of CHERRY RED SPOT

1> Berlin's edema - Q AIMS

2> CRAO -

3> Depositions -

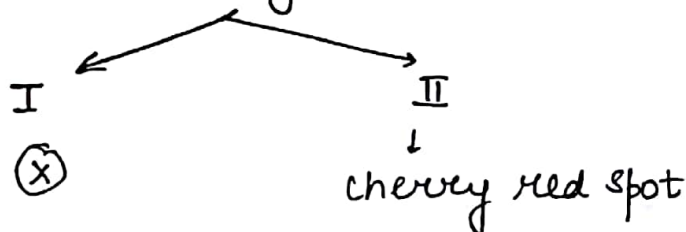
a> Tay Sachs's

b> Neiman Pick

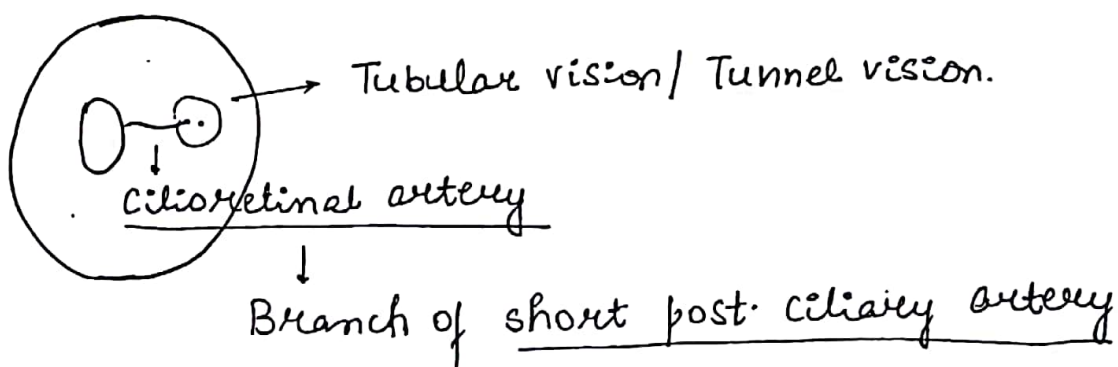
c> Gaucher's

d> GM-1 Gangliosidosis etc all except

### GM1 Gangliosidosis



Q Pt. suffered from CRAO But not Blind?



R<sub>x</sub> -

AIM of R<sub>x</sub> → Dislodge to emboli

↓  
Sudden fall of IOP

← I.V. ACETAZOLAMIDE

→ OCULAR MASSAGE



## CAUSES OF TUNNEL VISION

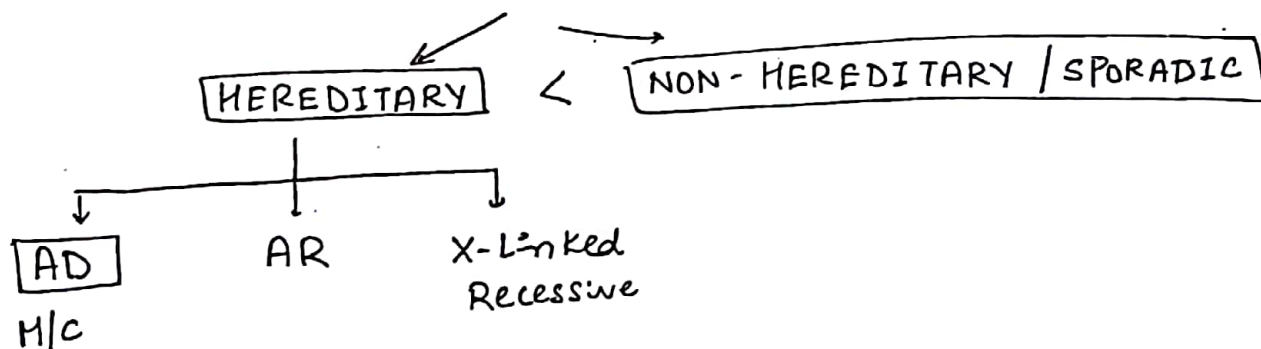
209

- 1> B/L OCCIPITAL LOBE LESION
- 2> CRAO = cilio retinal artery
- 3> Late stage of RETINITIS PIGMENTOSA
- 4> QUININE TOXICITY

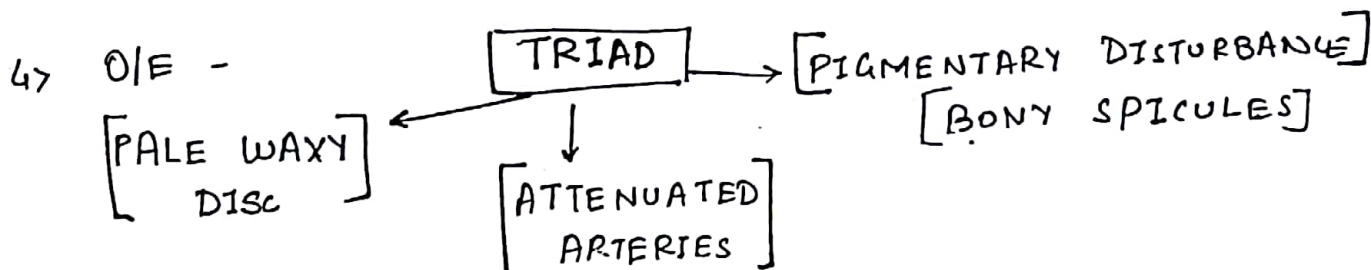
## RETINITIS PIGMENTOSA

- 1> Dystrophy of **Rods** & Cones (Photoreceptor cell)  
↓  
primarily affected

- 2> Genetic Disease & can be

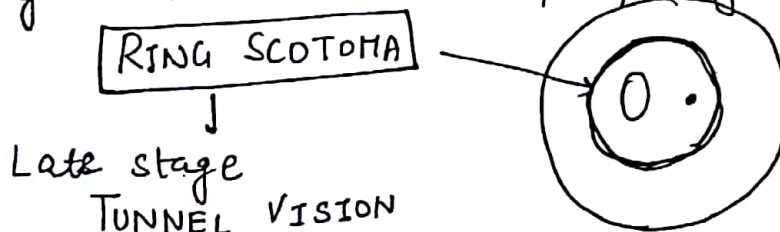


- 3> C/F = Nyctalopia



- 5> INV

- a) Perimetry → 1st involves mid periphery



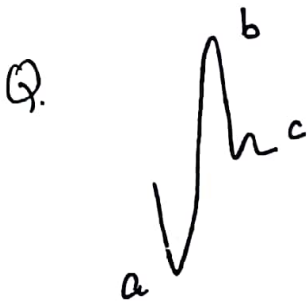
b7 ERG (Electro Retino Gram)

210

It tells the activity of outer 2 layer of Retina

Rods + cones      outer nuclear

↓  
Bipolar cells +  
Muller cells



a = Rods + cones

b = bipolar + muller cells

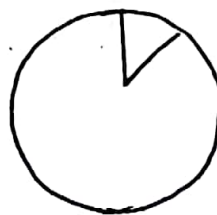
c = RPE.

In Retinitis Pigmentosa  $\Rightarrow$  ↓ amplitude of a + b waves

ATYPICAL RP.

1> SECTORAL RP

Better Prognosis than a  
typical case

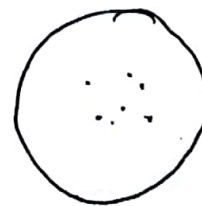


2> PERICENTRIC RP / INVERSE RP

starts from centre

3> RP SINE PIGMENTO

NO Bone spicule



SALT +  
PEPPER  
Fundus

4) RP ALBESCENS



white spots

## SYSTEMIC ASSOCIATION

1) Q. USHERS SYNDROME → M/C  
RP + Deafness

R<sub>x</sub> = no effective R<sub>x</sub>

Vit A for rods

Vit E as an anti-oxidant

2) BEST Disease / BEST VITELLIFORM DYSTROPHY

→ AD

→ childhood disease

→ Dystrophy of RPE

→ O/E - Macula → egg yolk Appearance

Q EDG - Ab (N)

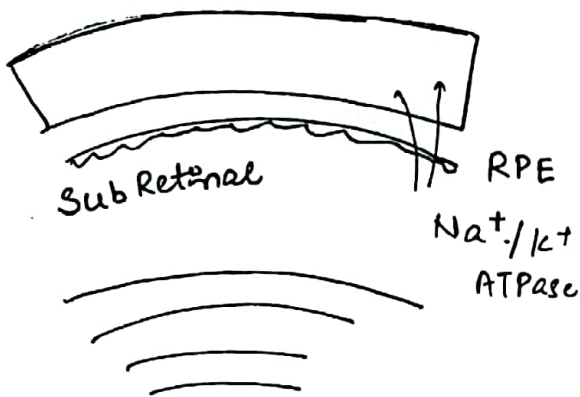
## ELECTRO-OCULO-GRAM

Measures standing potential of eye.

Q. ARDEN RATIO =  $\frac{\text{Light Peak}}{\text{Dark Trough}}$   $> 1.85$ . (N)

In BEST DISEASE =  $< 1.5$

## CENTRAL SEROUS RETINOPATHY (CSR)<sup>212</sup>



### PATHOGENESIS

Weakening of  $\text{Na}^+/\text{K}^+$  ATPase Pump of central Retinal Pig. Epithelium

↓  
Collection of fluid in Sub-Retinal Space

↓  
Causing shallow Retinal Detachment

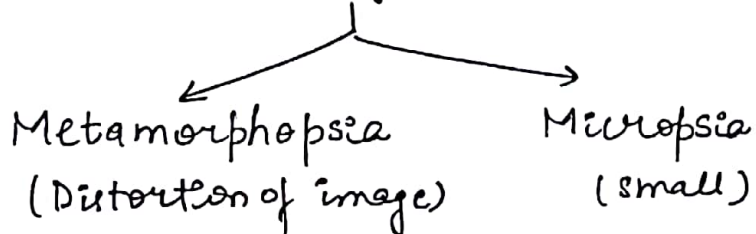
↓  
**CSR**

### C/F -

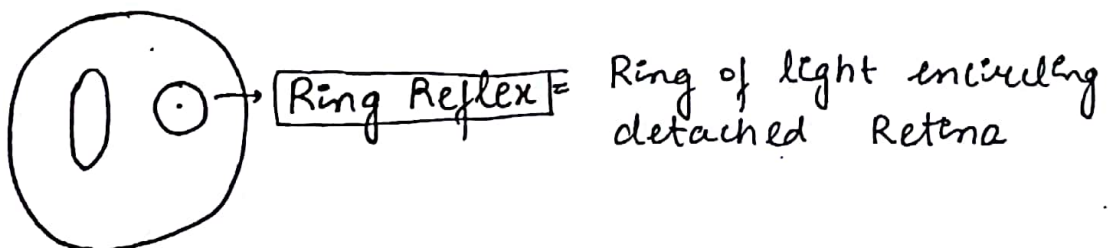
Q1> young ♂

Q2> self-limiting

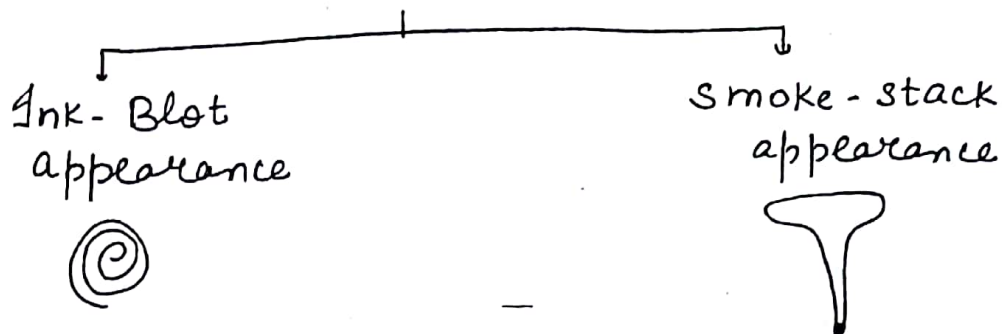
3> Disturbance of vision



4> O/E

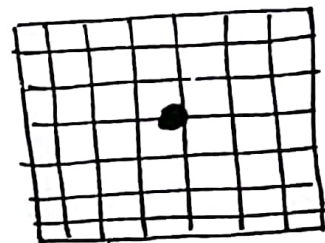


5> Inv :- ① FFA QQ



### ② AMSLER-GRID TEST

- Piece of paper w a central dot
- Pt can tell if any disturbance of vision.



6>  $R_x$  - not Required  
steroids c/I  $\Rightarrow$  aggravate CSR

$\Rightarrow$

CYSTOID      MACULAR      OEDEMA

### CAUSES

- I> INFLAMMATORY-  
all causes of Intermediate & Posterior Uveitis
- II> VASCULAR CAUSE-
- III> DEGENERATIVE  
Retinitis Pigmentosa
- IV> IRVINE GASS SYNDROME  
CME after cataract sx as a post-op complication

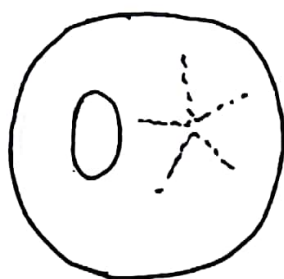
C/F-

- 1> Diminution of vision
- 2> O/E → Dull or absent foveal Reflex

3>

Inv-

- 1> FFA



→ FLOWER-PETAL PATTERN QQ

↓  
outer plexiform layer is Radially present → HENLE'S Layer

↓  
So, leakage is Radial

Rx-

- 1) Oral Acetazolamide \*
- 2) Topical NSAIDs-  
Indomethacin.

## PUTSCHER'S RETINOPATHY

### ETIOLOGY

- Q. 1> Pancreatitis → acute  
Other causes-

- ✓ Head Trauma
- ✓ Chest "

### PATHO

Air/Fat embolism



multiple  
cotton wool  
spot



Rx - no effective Rx.

215

## BULL'S EYE MACULOPATHY

Alternate areas of hyper · hypo pigmentation

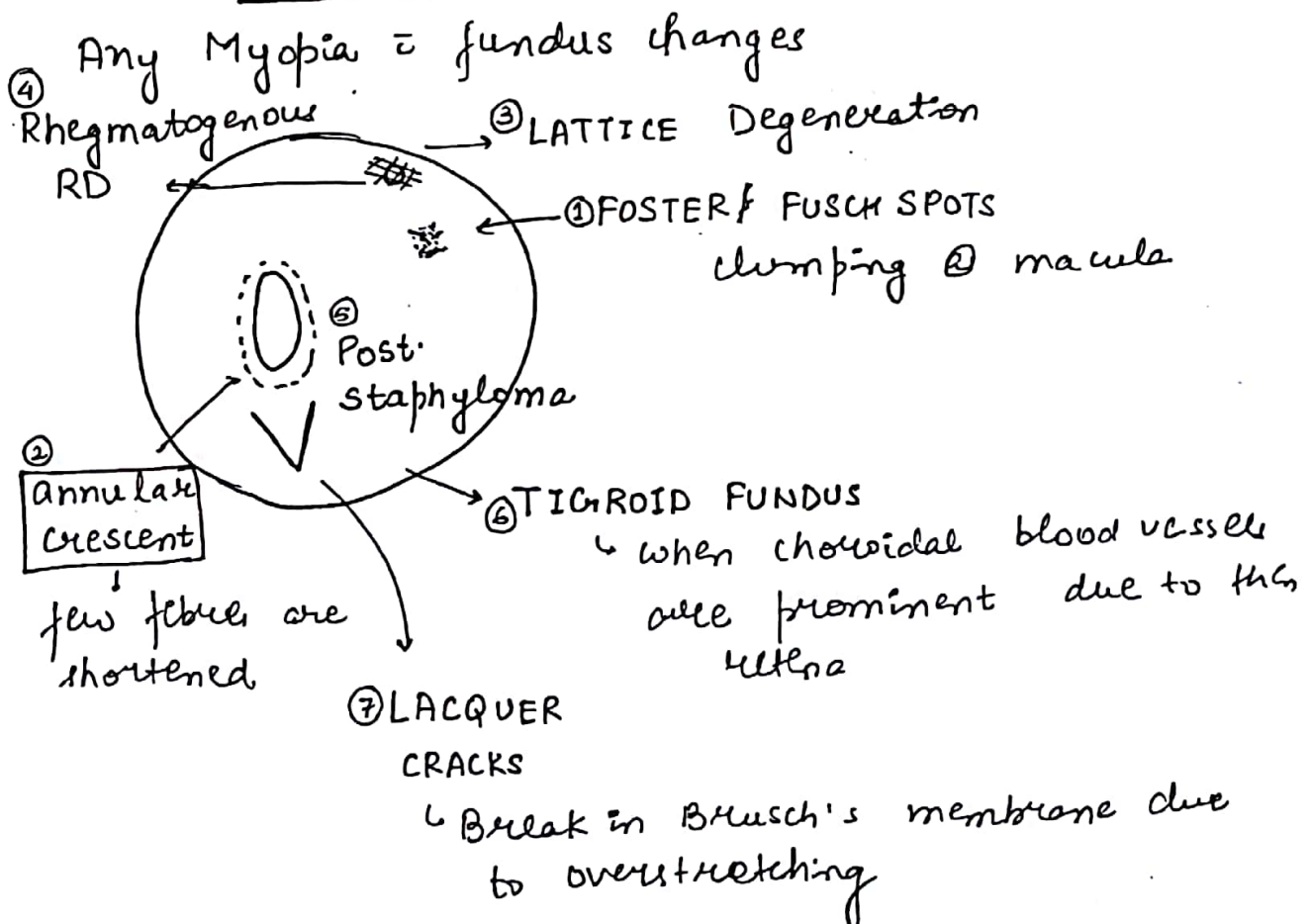
ETIO-

- 1> Chloroquine
- 2> Hydroxychloroquine
- 3> Cong Dystrophy
- 4> Batten Mayo Syndrome / Battens Disease



↓  
cerebro-macular degeneration.

## PATHOLOGICAL MYOPIA



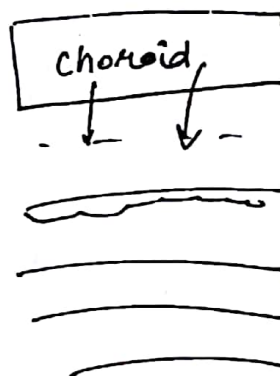
# RETINAL DETACHMENT

216

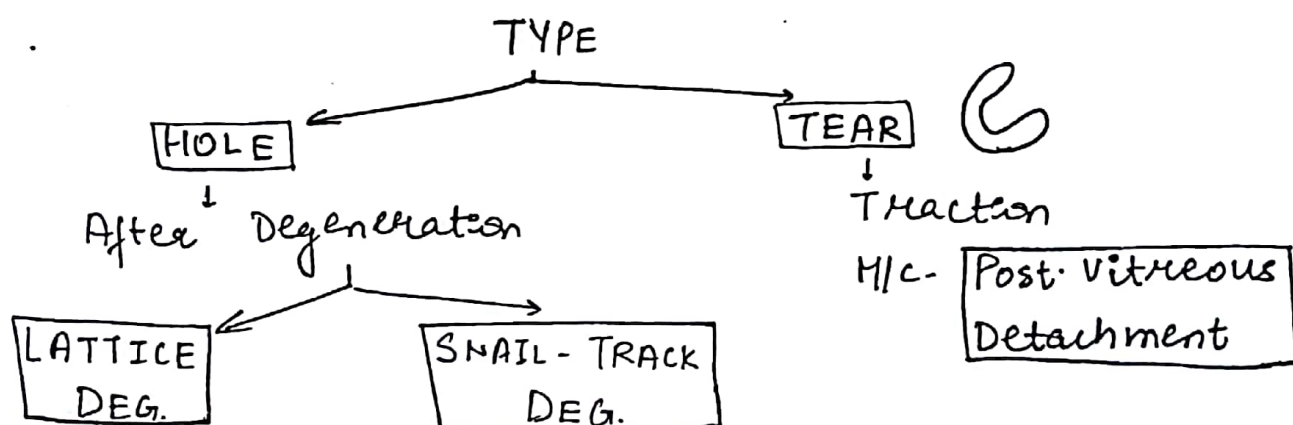
separation of RPE from Neurosensory Retina

## TYPES

- 1> TRD (Tractional RD)
- H/C 2> RRD (Rhegmatogenous RD)
- 3> ERD (Exudative RD)



## RHEGMATOGENOUS RD



C/F :

- 1> D/v
- 2> Visual field Defects
- 3> Floaters → opacities in vitreous cavity
- 4> Photopsia → flash of light seen by pt.  
due to traction on Rods / Cones

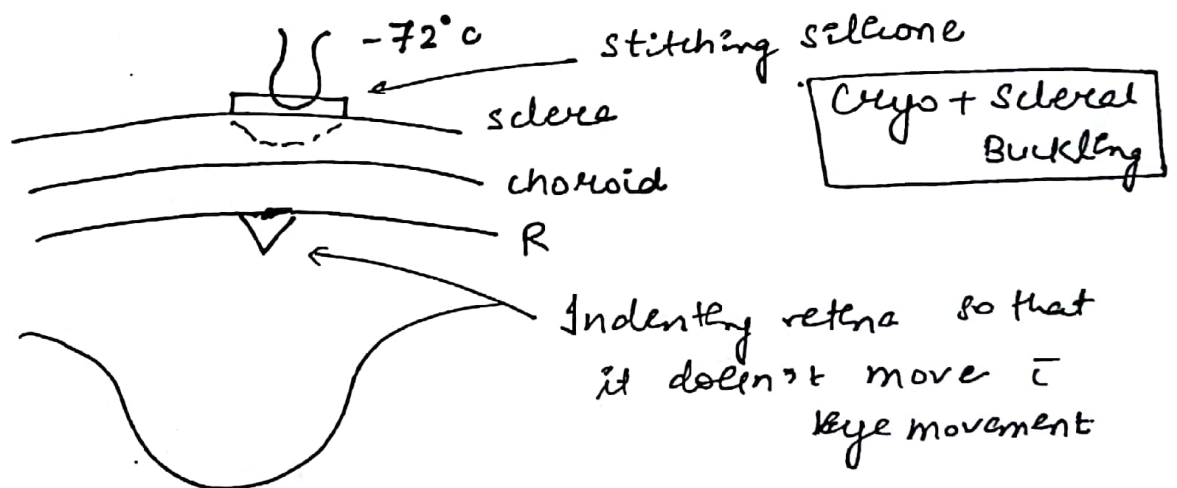
Look grey due to detachment

R<sub>x</sub>-

① TRD → 1) PRP  
2) S<sub>x</sub>

② ERD → R<sub>x</sub> the cause

③ RRD → close the break



## RETINOPATHY OF PRE-MATURITY (ROP)

PATHO

Free Radical Injury to developing blood vessel

↓  
Hypoxia

↓  
Retinitis Proliferans

C/F -

218

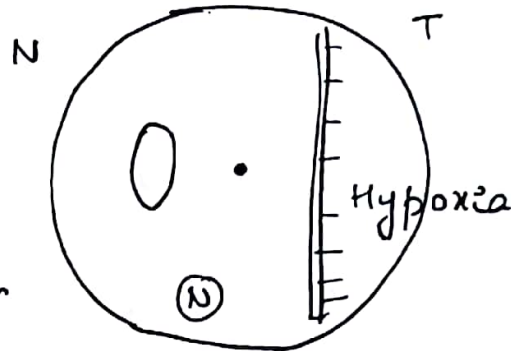
STAGE 1 → Demarcation Line

STAGE 2 → Ridge formation

STAGE 3 → Neovascularisation

STAGE 4 → Subtotal RD

STAGE 5 → Total RD



Rx OF ROP -

Q. Laser Photo-coagulation of Hypoxic Pts.

PROPHYLAXIS -

17 Vit E Therapy

Q.  $\leq$  factor is more Imp for occurrence of ROP?  
⇒ Prematurity

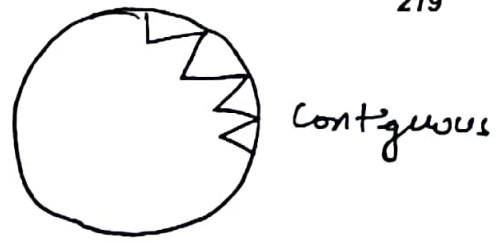
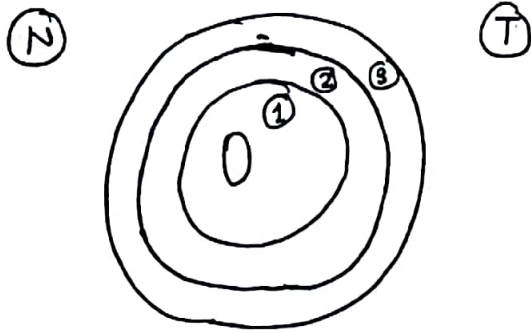
Q. Ideal Time of screening for ROP?

Add 4 week to Post natal age (31-33 wks)  
Later.

THRESHOLD RETINOPATHY → other name of ROP.

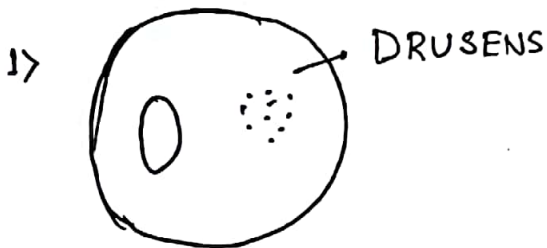
CRITERIA -

STAGE	ZONE	EXTENT	PLUS DISEASE
III + Above	1,2	5 contiguous or 8 non-contiguous clock hours	Tortuosity of artery + vein

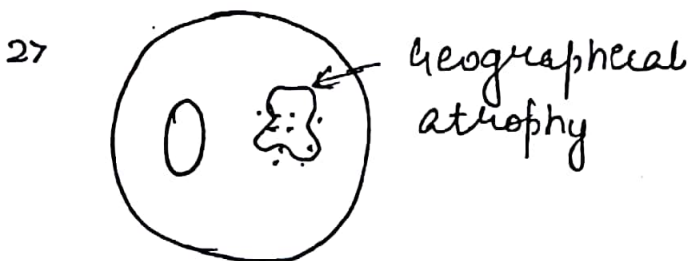


## AGE RELATED MACULAR DEGENERATION (ARMD)

- Choroidal Disease
- Degenerative changes at macula in old age
  - ↳ irreversible loss of vision

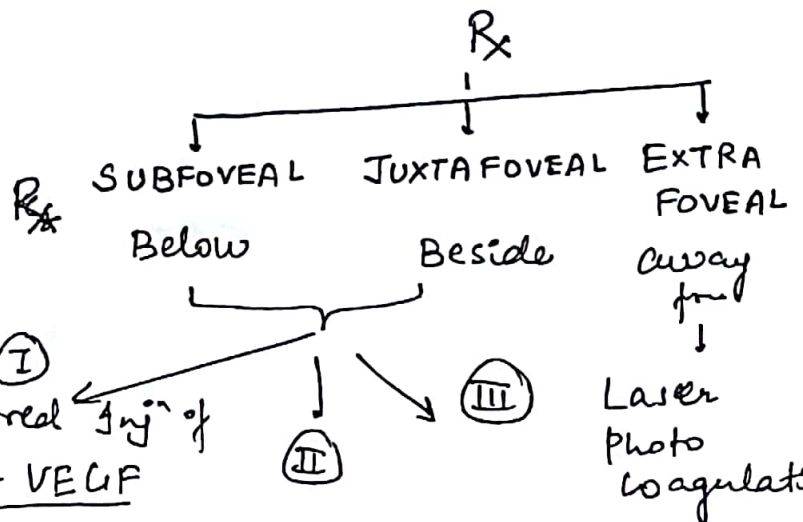


1> RPE Detachment



2> choroidal / subretinal neovascularization.

No effective Rx



Avastin  
Bevacizumab  
Ranibizumab  
Lucentis

Intravitreal inj<sup>n</sup> of  
Anti-VEGF



Q ② Photodynamic Therapy

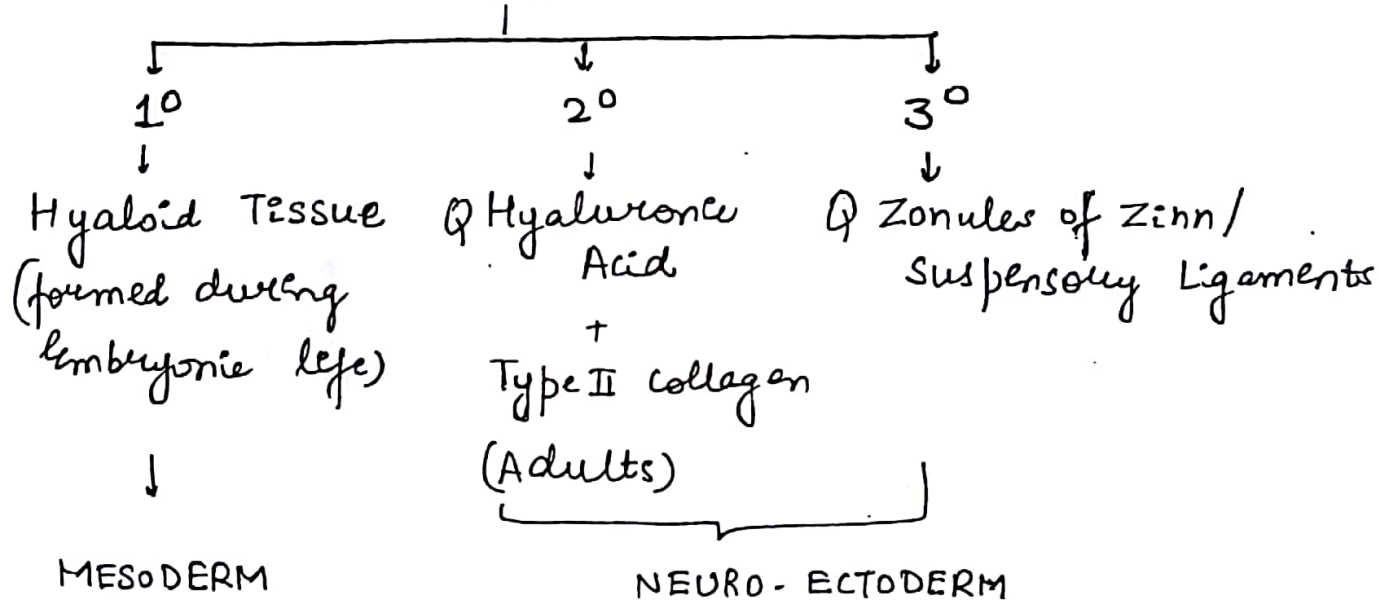
↓  
Verteporfin  
+  
Diode  $\gamma$

Hypopigmentation or whitening  
of the area occurs immediately  
after PDT

③ TTT (Trans-Pupillary Thermotherapy)

↓  
Thermal effect is used to damage the membrane

### VITREOUS



Q Strongest attachment to retina  
↳ At Vitreous Base  
(Ora serrata)

Q Is it more in vitreous?

Ascorbate

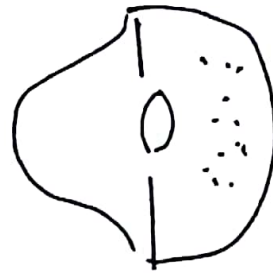
V:P = 9:1



## FLOATERS

opacities in vitreous

- 1) Inflammatory cells
- 2) Pigments
- 3) Hyaline clots
- 4) Synchysis Scentillans
  - ↳ Cholesterol Bodies
- 5) Asteroid Bodies
  - ↳ asteroid hyalosis

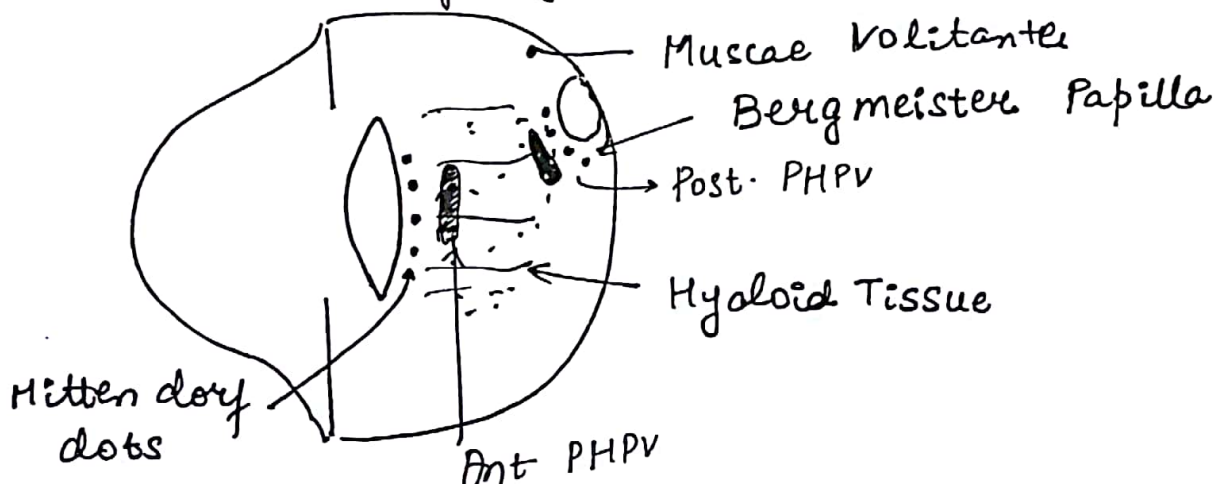


221

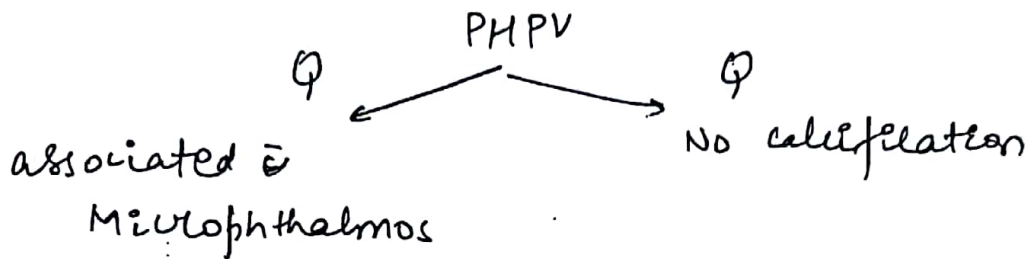
- Q
- a) Disease of old age
  - b) ♂
  - c) ~~De~~ VA (N)
  - d) Ca + Lipids
  - e) A/E DM, HTN, high cholesterol,
  - f) Hypermetropia
- Qf) Not associated w myopia

## 6) MUSCAE VOLITANTES-

Remnants of Hyaloid Tissue



Ant PHPV  $\rightarrow$  Better Prog than Post- PHPV.



## COMMUNITY OPHTHALMOLOGY

Q M/cc of Blindness in India = CATARACT

Q M/cc of Preventable Blindness = , CATARACT  
4 Trachoma

Q M/cc of childhood Blindness in India Vit A Def

Q 2<sup>nd</sup> M/cc of Blindness = Refractive error (RE)

Q M/cc of ocular Morbidity = RE

Q M/cc of Blindness in world = Cataract

Q M/cc of Blindness in developed countries = Glaucoma  
↓  
ARMD

Q Be Define Blindness → WHO

NPCB

Legal

Best corrected visual acuity in Better eye  $< 3/60$   
(BCVA)  
or

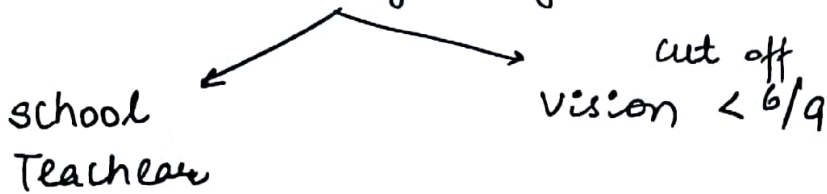
visual field (Better eye)

Q. BCVA  $< 6/60$  - NPCB Def<sup>n</sup>  
 $<$  Better eye

Q Prevalence of Blindness in India = 0.56%  
( $> 50$  yrs = 1.1%)

Q. Incidence of Cataract In India = 62.6%

Q School Screening Programme



VISION - 2020

